Supreme Court, U. S.
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IN THE

Supreme Court of the United States

OCTOBER TERM, 1978

No. 78-1652

MARTIN HAROLD HODDER, ROWENA E. ROBERTS, KEVIN DONOVAN, LORRETTA DONOVAN, E. GARDNER PRIME, VALERIE PRIME, NATHANIEL ERIC HODDER,

Petitioners,

v.

UNITED STATES NUCLEAR REGULATORY COMMISSION and UNITED STATES OF AMERICA,

Repondents,

and

FLORIDA POWER & LIGHT COMPANY,

Intervenor.

SEPARATE APPENDIX TO PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE DISTRICT OF COLUMBIA CIRCUIT

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UNITED STATES OF AMERICA
ATOMIC ENERGY COMMISSION

LBP-74-55

ATOMIC SAFETY AND LICENSING BOARD

John B. Farmakides, Chairman
David L. Hetrick, Member
Frank F. Hooper, Member

In the Matter of

FLORIDA POWER & LIGHT COMPANY

(St. Lucie Nuclear Power Plant,
Unit 2)

Docket No. 50-389

July 12, 1974

PREHEARING CONFERENCE ORDER #3

A prehearing conference was held in the above-captioned matter on June 20, 1974, pursuant to properly issued notice for same. The parties were all represented and participated in the following actions:

(a) Preparation of a firm schedule leading to the evidentiary hearing.

(b) Discussion and refinement of issues in controversy.

(c) Submission of joint motion of party Intervenor and AEC Regulatory Staff as to issues in controversy in lieu of earlier admitted contentions.

(d) Status of Mrs. Betty Lou Wells in this proceeding.

As a result of all the comments, arguments, and pleadings filed, and after careful review of the joint motion filed by the AEC Regulatory Staff (Staff) and the Invervenor (hereafter June 25 Motion),[1] Applicant's response thereto, and the "good cause" statements of Mr. Hodder, the Board rules as follows:

1. Except where otherwise indicated, all contentions stated in Appendix A, attached hereto, are hereby admitted as matters in controversy in lieu of and in full substitution of all and any prior contentions appearing in Intervenor's pleadings, or the Board's Memorandum and Order of January 24, 1974. The Board carefully reviewed the June 25 Motion and has generally adopted it as a more precise and useful formulation of issues flowing from the petition to intervene, and the stipulation of the parties dated December 4, 1973, as

[1] Stipulation and Joint Motion, dated June 25, 1974, between party Intervenors and party AEC Regulatory Staff.

contained in the Board's Memorandum and Order dated January 24, 1974. Any contention proposed in said June 25 Motion and not expressly accepted, as stated by the parties, or as modified by the Board, and admitted as a matter in controversy in said Appendix A hereto, is expressly denied. Accordingly, whatever additional discovery is needed in light of the restated matters in controversy thus admitted herein may commence immediately. In view of said restated matters in controversy, it is expected that, following the scheduled period for additional discovery, the parties should be better able to, and will make full use of section 2.749 of the Rules of Practice and file Motions for Summary Disposition where appropriate.

2. The letter of Mrs. Betty Lou Wells dated December 9, 1973, relating to this proceeding has not been formally treated at an earlier date. It appeared to be in the nature of a request for limited appearance and if it is so intended, the Board hereby grants same and invites Mrs. Wells to express her views at the first day of the evidentiary session now scheduled for October 15, 1974, at a place to be designated later by the Board near the site of the proposed facility. If on the other hand, it is intended to constitute a petition to intervene, then the Board hereby expressly denies same because: (a) it completely fails to set out an interest, contentions and basis therefor, as required by section 2.714 of the AEC Rules of Practice; (b) and it was filed untimely—approximately two months later than the 30-day time limit provided by the Notice of Hearing dated September 13, 1973, without a showing of good cause.

3. The following schedule for all remaining procedural dates in this hearing is hereby established:

Final Date	For
(1) August 18, 1974	(1) All discovery requests
(2) August 30, 1974	(2) Responses to all discovery requests
(3) September 10, 1974	(3) Motions for summary disposition, if any
(4) September 17, 1974	(4) Responses to motions for summary disposition, if any
(5) o/a September 25, 1974	(5) Ruling on motions (by telephone to be confirmed by written order)
(6) October 2, 1974	(6) Filing all written testimony
(7) October 8, 1974	(7) Final prehearing conference
(8) October 15, 1974	(8) Evidentiary hearing commences

The Board notes that while the Applicant had initially requested September 30 as the commencement of the evidentiary hearing, and the Intervenor had requested October 30, (the AEC Regulatory Staff had no objection to either date), the Board decided on October 15 as a reasonable compromise for the

reasons stated at the conference. Accordingly, the Board considers the above schedule firm. Any request for change or extension of time must be justified by substantial showing of good cause.

It is so ORDERED.

ATOMIC SAFETY AND
LICENSING BOARD

John B. Farmakides, Chairman

Issued at Bethesda, Maryland,
this 12th day of July 1974

St. Lucie Nuclear Power Plant
Docket No. 50-389
Prehearing Conference Order #3

APPENDIX A

July 12, 1974

The following contentions are hereby admitted as matters in controversy in this proceeding:

Contention 1.1

Whether the St. Lucie Unit 2, alone, or in combination with other plants on the site will discharge radioactive effluents to air and water which are not "as low as practicable" as to:

(a) gaseous radwaste from condenser air ejectors; mechanical vacuum pump; radwaste, reactor and turbine building vents; and containment purge.

(b) liquid radwaste returned to the condensate system and packaged for offsite shipment or discharged from the plant in the circulating water system.

Contention 1.2

Whether even if radioactive effluents from St. Lucie Unit 2, alone, or in combination with other plants on the site, comply with the Commission's "as low as practicable" criteria, the cost-benefit balance is unfavorable for the facility because the following costs are still too great:

(a) the genetic effect on the population and plant employees generally;

(b) the genetic effect on human fetuses and breast-fed infants;

(c) the genetic effect through milk pathway to consumers of milk produced within a 50-mile radius of facility;

(d) the genetic effect through the food pathway including leafy vegetables.

Contention 1.2.1

Whether even if radioactive effluents from St. Lucie Unit 2, alone, or in combination with other plants on the site, comply with the Commission's "as low as practicable" criteria, the cost-benefit balance is unfavorable for said Unit 2 because such effluents will produce somatic damage to persons particularly susceptible to carcinoma.

Note: The Board has formulated and admitted this contention in view of Contention 1.2 above and after consideration of comments in joint motion supplied by Staff and Intervenor on Contention 1.2 and all subsequent pleadings thereto.

Contention 1.3

Whether sufficient need for power will exist to justify the present construction of the facility, particularly whether:

(a) the projected reserve margin without the facility would be adequate;

(b) conservation measures by consumers due to changes in the rate structure designed to reduce the demand for electricity including peak pricing and higher overall prices will eliminate or postpone the need for the facility;

(c) whether or not there shall occur in the future a slowed rate of economic growth in Florida, which would reduce the need for power;

(d) whether there are power pools for Applicant to join; and if so by joining such pools, whether its reserve needs would be diminished sufficiently to eliminate the need for the facility;

(e) conservation of electricity by Applicant's customers is due to increased rates presently occurring.

Contention 1.4

The Staff's Final Environmental Statement and NEPA cost-benefit analysis has not sufficiently considered whether the use of cooling water from the Indian River, through the emergency cooling water canal, will have adverse effects on the Indian River environment, which, as to emergency water should have been considered, and as to water used in testing, was not considered sufficiently in the FES.

Note: This contention may reasonably be considered to flow from Board's January 24 Order, Contentions 3 and 16. The Board has admitted it by resolving doubt in favor of Intervenor and in view of the essence of the allegation which goes to the adequacy of the Staff's Final Environmental Statement. The Board believes that such a challenge to the FES should be heard and decided on the record.

Contention 1.5

Whether the use of cooling water for normal operation will have adverse effects on the marine environment not considered sufficiently in the Final Environmental Statement, including:

(a) diversion or creation of currents resulting in increased beach erosion;

(b) diversion or creation of currents which can affect filter feeding organisms by removing their food sources;

(c) entrainment injury of marine organisms, fish, and skin divers;

(d) increased water temperatures which may increase death or injury to marine organisms or affect their breeding.

Contention 1.6

Whether the Staff's Final Environmental Statement has sufficiently considered alternatives to the proposed action including:

(a) alternative fossil generating methods in that fuel costs and more economical fuel delivery systems have not been explored;

(b) alternative sites especially sparsely populated areas such as Southwest Florida;

(c) alternative ultimate heat sink methods such as auxiliary ocean intake or wet or dry cooling towers using salt or fresh water or treated sewage effluent.

Note: This issue may reasonably be considered to flow from Board's January 24 Order, Contentions 3 and 11. The Board has admitted it by resolving doubt in favor of Intervenor and in view of the essence of the allegation which goes to the adequacy of the Staff's Final Environmental Statement. The Board believes that such a challenge to the FES should be heard and decided on the record.

Contention 1.7

Whether the Applicant has adequately provided protection against the occurrence of radioactive releases resulting from a fuel handling accident at the site or in fuel transportation to and from the site.

Contention 2.1

Whether the proposed site meets the requirement of 10 CFR Part 100 as to meteorological conditions including:

(a) whether the Staff has adequately considered meteorological considerations peculiar to the site, particularly as to the frequency and strength of:

(1) hurricanes occurring below the thirty-fifth parallel;

(2) hurricane storm surges;

(3) northeaster storm surges;

(b) whether hurricanes pose such a severe threat to the safe operation, due to their accompanying land erosion, high winds and storm surges, and their resultant effect on the site, its equipment, buildings and the intake water canal and emergency cooling canal and means of ingress and egress, that the site is unsuitable.

(c) whether the diesel generators would start at the height of a hurricane including whether waveborne or airborne water entering the air intakes, designed building openings, and storm-created building openings could prevent operation;

(d) whether Applicant and Staff should have considered the maximum possible hurricane such as Camille-type storm (225-mile an hour winds and more than a 16-foot surge) rather than the maximum probable hurricane as a design basis for the facility.

(e) whether prevailing winds from the proposed site blow toward the populous area of Ft. Pierce, only 8 miles away, and whether a stabilizing effect exerted by the Indian River on the radioactive gas plume from the accident would limit the dispersion of such plume so as to render the proposed site unsuitable.

Contention 2.2

Whether the proposed site meets the requirements of 10 CFR Part 100 as to population density and use characteristics of the site environs, including:

(a) whether Applicant and Staff have adequately considered present population and future demographic change near the site, particularly:

(1) whether increased population of Hutchinson Island resulting from high-rise, high-density condominiums and resort hotel development with larger tenant capacities;

(2) whether within the low-population zone (LPZ), real estate developments and subdivisions on the mainland three to five miles away from the proposed site which are currently more populous than Staff and Applicant estimate and whether this will result in the very high population density within the next decade far in excess of Applicant population projections in the Environmental Report (ER) and Preliminary Safety Analysis Report (PSAR);

(3) in nearby cities of Stuart, Jensen Beach, White City, and Fort Pierce within 10 miles of the proposed site;

(b) whether Applicant's presentation in the PSAR, Figure 2.1-2, an aerial photograph of Hutchinson Island, fails to include the entire area from five to ten miles from the proposed site and the development occurring there, and whether such information is necessary to accurately assess site suitability;

(c) whether the demographic studies performed for Applicant by First Research Corporation of Miami are inaccurate and misleading and underestimate the high population in the site environs including the LPZ;

(d) whether there is a reasonable probability that appropriate measures could be taken in the event of an accident to protect residents including evacuation of LPZ personnel, particularly whether the single, two-lane highway, A1A, on Hutchinson Island:

(1) is sufficient for evacuation and access for emergency equipment;

(2) could be separated by a storm or accident at the site since the road bisects the site which would result in division and splitting up of emergency evaucation and safety efforts;

(3) would cause highway A1A traffic to bottleneck at the single bridge at each end of the island, diminishing the possibility of escape from an island in an emergency;

(e) whether Applicant's ability to control activities and traffic on and near the site within the exclusion area is adequate, particularly;

(1) whether Applicant specifically has no control over traffic on highway A1A which bisects the plant site;

(2) whether Applicant has voluntarily relinquished control over the beach areas within the site boundary since they have no control in that area;

(3) whether Applicant's plans for controlling personnel in beach and highway areas are inadequate.

Contention 2.3

Whether the proposed site meets the requirements of 10 CFR Part 100 as to seismic considerations, particularly whether Applicant's seismic studies are incomplete, inaccurate, inadequate, including:

(a) insufficient evidence of lack of faults;

(b) no information on ten-foot plus offsets;

(c) bore holes too far apart to detect faults;

(d) bore holes choice improper, i.e., no history submitted on bore hole selection;

(e) failure to complete into St. Lucie County the study of the postulated Martin County fault;

(f) an attempt to adequately chronicle earthquake history for three hundred years;

(g) too few blow count samples in the area 70-feet to 85-feet depth strata and whether this area shows liquefaction potential;

(h) failure to consider dynamic interaction of units 1 and 2;

(i) emergency cooling canal slide blockage potential;

(j) whether a fault exists five miles from the site and whether the fault is a capable fault.

Contention 3.1

Whether the Applicant's plans for the use of water from the Indian River as a backup source of emergency cooling water provide for an adequate ultimate heat sink during periods of extremely low tides.

Contention 3.2

Whether Applicant's emergency plan complies with Appendix E to 10 CFR Part 50 in that neither Applicant nor any state agency has adequately addressed the problem of adequate evacuation of the LPZ.

Contention 3.3

Whether Applicant's proposed emergency core cooling system, or ECCS meets the requirements of AEC regulations.

Contention 3.4

Whether the Applicant in its proposed design and construction of St. Lucie Plant No. 2 has considered and adequately provided for any possible adverse effects of fuel densification.

Note: With respect to the additional issues which party Intervenor seeks to raise as set forth on pages 11 and 12 of the Stipulation and Joint Motion, the Board rules as follows:

1. As to statement on Contention 1.1 (page 11, Joint Motion) the Board agrees with the AEC Regulatory Staff position that such an issue is currently within rulemaking and not proper subject matter for this proceeding.

2. As to statement on Contention 1.2 (page 11, Joint Motion) Board has defined it as Contention 1.2.1, above, and admits same as matter in controversy.

3. As to statement on Contention 1.3 (page 11, Joint Motion) Board rules that Contention 1.3 as admitted contains the contention of party Intervenor as stated in Board's January 24 Order. Intervenor has failed to show sufficient good cause to justify expanding his earlier contention.

4. As to statement on Contention 1.4 (page 12, Joint Motion) Board has admitted said contention as modified, as a matter in controversy.

5. As to statement on Contention 1.5 (page 12, Joint Motion) Board has admitted same as a matter in controversy.

6. As to statement on Contention 1.6 (page 12, Joint Motion) Board rules, that, except as set forth in Contention 1.6 on page 4 of Joint Motion, said proposed issue does not flow from any contentions admitted and set forth in the Board's January 24 Order. Intervenor has failed to show good cause why it should now be admitted. As to the "waste storage-fuel cycle" subissue, Board has previously denied same.

7. As to statement on Contention 1.7 (page 12, Joint Motion) Board agrees

that there has been no showing of a reasonable possibility of class 9 accident at St. Lucie and therefore an issue relating to a class 9 accident is denied.

8. As to statement on Contention 2.2 (page 12, Joint Motion) Board finds this proposed issue to be new and finds further that party Intervenor has failed to show substantial good cause for adding this issue as a new matter in controversy.

This appendix is incorporated in and made a part of Prehearing Conference Order #3, Docket No. 50-389, issued by this Board on July 12, 1974.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

LBP 75-5

ATOMIC SAFETY AND LICENSING BOARD

John B. Farmakides, Chairman
David L. Hetrick, Member
Frank F. Hooper, Member

In the Matter of

FLORIDA POWER & LIGHT COMPANY

(St. Lucie Nuclear Power Plant
Unit No. 2)

Docket No. 50-389

February 28, 1975

APPEARANCES

Norman A. Coll, Esq., and Matthew M. Childs, Esq., McCarthy, Steel, Hector and Davis, accompanied by Harold F. Reis, Esq., Jack R. Newman, Esq., and Anthony Gambardella, Esq., Newman, Reis, and Axelrad on behalf of Applicant.

Martin H. Hodder, Esq., on behalf of the Intervenors.

Richard Boone, Esq., on behalf of the Regulatory Staff, Federal Power Commission.

Perry B. Seiffert, Esq., James Tourtellotte, Esq., Gregory Fess, Esq., Daniel Swanson, Esq., and A. Gray Staples, Esq., on behalf of the Regulatory Staff.

Upon application for construction permit for St. Lucie Unit 2, Licensing Board issues a partial initial decision on environmental and site suitability aspects of the facility and makes factual determinations requisite for the issuance of an LWA, including imposition of certain conditions.

LWA: SITE REDRESSIBILITY

An applicant may be required to redress the site after LWA activities in the event a construction permit is subsequently denied. The extent to which such LWA activities can be redressed must be factored into the cost-benefit balance to be performed by the Board.

PARTIAL INITIAL DECISION— ENVIRONMENTAL AND SITE SUITABILITY

I. Preliminary and Background

1. By application filed on May 14, 1973, the Florida Power and Light Company (Applicant) moved for a construction permit authorizing the construction of the proposed St. Lucie Nuclear Power Plant, Unit No. 2 facility. The proposed plant is a nuclear pressurized water reactor with a gross electric power output of approximately 850 MW and a thermal power rating of 2560 MW. The Unit is to be constructed on Hutchinson Island, approximately midway between the cities of Fort Pierce and Stuart, Florida, and will be adjacent to St. Lucie Unit No. 1, a nuclear plant of similar design and power output currently being constructed on the same site pursuant to Construction Permit CPPR-74 (Docket No. 50-335).[1]

2. On September 21, 1973, the U.S. Atomic Energy Commission (Commission) published in the *Federal Register* a Notice of Hearing on Application for Construction Permit.[2] The Notice, *inter alia*: (1) set forth the requirements to be met in considering the application pursuant to the Atomic Energy Act of 1954, as amended;[3] (2) established issues pursuant to the National Environmental Policy Act of 1969 (NEPA);[4] (3) provided that persons wishing to intervene in the proceeding could file petitions for leave to intervene by October 23, 1973; and, (4) designated this Atomic Safety and Licensing Board (Board) for this proceeding.

3. Pursuant to said notice, on October 23, 1973, a Petition for Leave to Intervene was filed by Martin Harold Hodder, *pro se*, and as Attorney for Rowena E. Roberts, Kevin M. Donovan, Loretta Donovan, E. Gardner Prime,

[1] Final Environmental Statement (Staff Exhibit S-1, p. 1-1).
[2] 38 *Fed. Reg.* 26482.
[3] 42 U.S.C. 2011, et. seq.
[4] 42 U.S.C. 4321, et. seq.

Valerie Prime, and Nathaniel Eric Hodder (Intervenors). A letter dated December 9, 1973, and filed by Mrs. B. L. Wells was denied as a petition to intervene for failure to conform to requirements of § 2.714 of the Rules and for untimely filing. Mrs. Wells, however, was granted permission to make a limited appearance and did so at the evidentiary hearing. Pursuant to a "Notice of Special Prehearing Conference", issued on November 16, 1973,[5] this Board held a prehearing conference in Miami, Florida, on December 4, 1973. By its "Prehearing Conference Order" of January 24, 1974, the Board admitted certain contentions of Intervenors as issues in controversy in this proceeding and ordered commencement of discovery. All contentions not admitted were denied. Accordingly, this proceeding is a contested proceeding as defined in 10 CFR § 2.4(n).

4. On June 20, 1974, the Board issued "Prehearing Conference Order No. 3" setting forth in Appendix A thereof the issues admitted as matters in controversy in this proceeding.[6] The matters in controversy thus admitted were further refined through prehearing procedures and procedural rulings to the effect that Contention 2.2 was amended to include subissues relating to: (a) reactor distance to nearest population center; (b) definition of LPZ; and (c) definition of exclusion area. Contention 1.2(c) was amended to change the word "genetic" to "somatic".[7]

5. By separate motions filed on September 10, 1974, the Applicant and AEC Regulatory Staff moved for summary disposition under § 2.749 as to specific contentions of the Intervenor. The Board ruled thereto in an Order on Motions for Summary Disposition dated September 25, 1974. *Inter alia*, it noted that Applicant's motion as to Contentions 1.5, 2.1(e), and 3.1[8] were not opposed by Intervenor, concluded that there was no material fact in dispute thereto and accordingly granted the motions for summary disposition and dismissed said contentions. The Board also dismissed Contentions 1.6(a)(b), 1.7, 2.1(a)(c)(d), and 2.2(e)(1)(2) after finding that no genuine issue of material fact was raised thereby. After allowing Intervenor further time to respond to Applicant's Motions for Summary Disposition on Contentions 1.4 and 2.2(e)(3), the Board ruled that no genuine issue of material fact existed with respect to these contentions, and accordingly dismissed them.[9] The Board denied Motions for Summary Disposition as to Contentions 1.2.1, 1.6(c), 2.1(b), and 2.3(i).[10]

[5] 38 *Fed. Reg.* 29483.

[6] The matters in controversy admitted are reproduced as Appendix A to this Initial Decision. (Appendix A is omitted from this publication.)

[7] Tr. 161, 446, 683.

[8] See Appendix A (omitted from this publication).

[9] Tr. 157 (as corrected), 160.

[10] Thus the final list of contentions for hearing were: 1.1(a)(b); 1.2(a)-(d); 1.2.1; 1.3(a)-(e); 1.6(c); 2.1(b); 2.2(a)-(d); 2.3(a)-(j); 3.2.

6. In addition to the final statement of contentions, the Board itself raised questions on which it required the Applicant and Staff to produce testimony. These questions were issued as Appendix A to the Board's September 24 Order and are reproduced herein as Appendix B to this Initial Decision. (Appendix B is omitted from this publication.)

7. Pursuant to published notice[11] the Board held a third Prehearing Conference on October 8, 1974. Thereafter, the evidentiary hearings began on October 16, 1974, and continued on consecutive days until the hearing was completed, except for those recesses requested by the parties.[12] Limited appearance statements were received in the record from four persons.[13]

8. The record in this case consists of all the material pleadings filed, all the evidence received, including all the exhibits identified and incorporated in Appendix C (omitted from this publication) to this Initial Decision, and all the transcripts of testimony presented at the prehearing conferences and the evidentiary hearing as corrected by Order correcting transcripts dated February 27, 1975. The Board, after discussion with the parties, undertook its own independent research and took official notice of a Staff exhibit it found to be an official document of the State of Florida which had been consulted by a Staff witness. In addition, at the request of the Board,[14] made on the record with notice to all parties, the Applicant filed on November 27, 1974, with copies to all parties, (a) the variance issued to the Applicant by the Florida Department of Pollution Control (DPC), (b) Applicant's letter to said DPC dated November 25, 1974. These three documents are received into evidence as Applicant's Exhibits 8, 9, and 10 respectively.

9. In making these findings and conclusions, the Board reviewed and considered the entire record of the proceeding and all the proposed findings of fact and conclusions of law submitted by the parties in the proceeding. All of such proposed findings of fact and conclusions of law which are not incorporated directly or inferentially herein are rejected as being unsupported in law or fact or as unnecessary to the rendering of this Partial Initial Decision. Numerous procedural motions and pleadings presented in the course of this proceeding were considered and resolved by the Board on the record and are not addressed in this Partial Initial Decision unless specifically referred to in the proposed findings of the parties and considered by the Board to be necessary in the rendering of this Decision. It is to be noted that the further evidentiary

[11] 39 *Fed. Reg.* 33587, September 18, 1974.

[12] Hearings were held on October 16-18, October 21-25, November 6-8 and November 18-19.

[13] Bruce Robinson of West Palm Beach, (Tr. 248), Harry Alder of Ft. Pierce (Tr. 249), Betty Lou Wells of Ft. Pierce (Tr. 251), and Carol Herzog of Ft. Pierce, (Tr. 250 and 260).

[14] Tr. 3299.

hearings to be held on the health and safety phase in this proceeding will include two contentions of Intervenors deferred from this environmental phase by agreement of all parties.

10. The Intervenor filed "Intervenor's Proposed Findings of Law" on December 16, 1974, and failed in that document to address Contentions 1.1, 1.2, 1.2.1, 1.6(c), 2.3, and 3.2. The Applicant filed "Reply of Applicant to Proposed Findings of Fact and Conclusions of Law" on December 27, 1974, in which the Board is requested to declare the Intervenor to be in default with respect to these issues. The Board, while agreeing that such default may exist, will nevertheless address all of the matters in controversy in an effort to resolve these matters on merit rather than on technical grounds.

II. Findings of Fact

A. Matters in Controversy

11. For clarity the Board will first address and resolve the matters in controversy admitted in this proceeding before addressing the ultimate issues contained in the Commission's Notice of Hearing or the questions posed by the Board. Contentions that are closely related will be grouped in categories and considered simultaneously.

12. The radiological impact of the proposed facility was the subject of the following contentions:

Contentions 1.1, 1.2, and 1.2.1

1.1 Whether the St. Lucie Unit 2, alone, or in combination with other plants on the site will discharge radioactive effluents to air and water which are not "as low as practicable" as to:

(a) Gaseous radwaste from condenser air ejectors; mechanical vacuum pump; radwaste, reactor and turbine building vents; and containment purge.

(b) Liquid radwaste returned to the condensate system and packaged for offsite shipment or discharged from the plant in the circulating water system.

1.2 Whether even if radioactive effluents from St. Lucie Unit No. 2, alone, or in combination with other plants on the site, comply with the Commission's "as low as practicable" criteria, the cost-benefit balance is unfavorable for the facility because the following costs are still too great:

(a) The genetic effect on the population and plant employees generally;

(b) The genetic effect on human fetuses and breast-fed infants;

(c) The somatic effect through milk pathway to consumers of milk produced within a 50-mile radius of facility;[15]

(d) The genetic effect through the food pathway including leafy vegetables.

1.2.1 Whether even if radioactive effluents from St. Lucie Unit No. 2, alone, or in combination with other plants on the site, comply with the Commission's "as low as practicable" criteria, the cost-benefit balance is unfavorable for said Unit No. 2 because such effluents will produce somatic damage to persons particularly susceptible to carcinoma.

13. Dr. Walton A. Rodger conducted an independent evaluation of the proposed facility, on behalf of the Applicant, using both the Staff's standards and a subjective cost-benefit analysis.[16] All radwaste systems cited in Contention 1.1 were included.[17] Dr. Rodger concluded that the design guides of the proposed Appendix I to 10 CFR Part 50 are met.[18] Using his cost-benefit analysis, Dr. Rodger also concluded that no additional radwaste treatment systems are warranted even if the population within 50 miles were to double.[19]

14. Drs. Joop W. Thiessen and Roger Linnemann evaluated genetic and somatic effects of radioactive effluents from the St. Lucie facility on behalf of the Applicant. They conclude that the genetic effects addressed in Contention 1.2 would not be measurable and that in the case of the general population such effects would be trivial.[20] With regard to Contention 1.2(c), they conclude that the risk of thyroid cancer, the dominant somatic effect through the milk pathway, will not be increased over that in the population at large.[21] Finally, they conclude that the risk to susceptible persons from other carcinogenic factors is far more important than their risk from all types of radiation, noting that the radiation component of the risk is dominated by the natural background radiation.[22]

15. The Staff evaluated the facility, including all radwaste treatment systems cited in Contention 1.1.[23] Using tabulated releases[24] and dose calculations[25]

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[15] At the request of the Intervenor, and following oral argument, the word somatic was inserted in lieu of the word genetic previously appearing in 1.2(c). (Tr. 446).

[16] Testimony of Dr. W. A. Rodger following Tr. 2098, p. 1-3.

[17] Id., pp. 4, 8.

[18] Id., at p. 18.

[19] Id., at p. 22; Tr. 2108-11.

[20] Testimony of Drs. Thiessen and Linnemann following Tr. 2100, p. 15.

[21] Testimony of Drs. Thiessen and Linnemann following Tr. 2102, p. 4.

[22] Testimony of Drs. Thiessen and Linnemann following Tr. 2106, p. 7.

[23] Testimony of James C. Malaro following Tr. 2236 pp. 4-5.

[24] FES pp. 3-26, 3-31.

[25] FES Section 5.4.

based on these releases, the Staff concluded that the St. Lucie facility will meet all of the Staff's "as low as practicable" guidelines, and in the Technical Specifications, the Applicant will be required to do so.[26]

16. Using population doses calculated by Staff Witness David A. Baker,[27] Staff Witness Dr. Michael A. Bender[28] evaluated genetic effects and Dr. Norman A. Frigerio[29] evaluated somatic effects. The Staff concluded that health effects will be negligible both in the exposed population and in its descendants.[30] With respect to Contention 1.2(c), the Staff concluded that the somatic risk through the milk pathway is so low that not a single mortality would be expected during the expected life of the plant.[31]

17. With respect to these contentions, Intervenors through their Witness Dr. Karl Z. Morgan questioned the calculation of I-131 dose because of a discrepancy between I-131 gaseous release calculations as made by the Applicant and the Staff.[32] However, the order-of-magnitude discrepancy (0.01 Ci/yr as compared to 0.09 Ci/yr) appears in a single component of the total I-131 release and was explained by the use of different sets of assumptions.[33] Calculations of total release of I-131 are more nearly in agreement: 0.31 Ci/yr as compared to 0.18 Ci/yr,[34] and there is agreement that the dose is determined by the total release.[35] Dr. Morgan also questioned the Staff's calculations of liquid releases as found in Table 3.3 of the FES p. 3-26, suggesting a number of improper omissions.[36] He asserted that, based on very conservative assumptions, a dose of 1 mrem/yr from C-14 could be expected at one kilometer from the plant.[37] However, the witness stated that he had performed no calculations for St. Lucie;[38] that the calculated result he cited is probably very high, perhaps by a factor of 100;[39] and agreed that even the cited result would not exceed the Staff's guidelines.[40] Dr. Morgan also asserted that a number of hazardous heavy

[26] See footnote 23, p. 5 *supra* (hereinafter a footnote will be designated "note").
[27] Testimony of David A. Baker, original version following Tr. 2246; amended version following Tr. 2376.
[28] Testimony of Michael A. Bender following Tr. 2555 (Corrections, Tr. 2364-67).
[29] Testimony of Norman A. Frigerio following Tr. 2503.
[30] Note 28, p. 9.
[31] Note 29, p. 1.
[32] Testimony of Karl Z. Morgan following Tr. 3052, p. 1; Tr. 2885.
[33] FES p. 3-29.
[34] Id., p. 3-30.
[35] Tr. 3063-64.
[36] Note 32, p. 2.
[37] Tr. 3117-18.
[38] Tr. 3075.
[39] Tr. 3077.
[40] Tr. 3116.

isotopes, including those of plutonium and americium, were improperly omitted from Table 3.3 of the FES.[41] He also criticized Table 3.3 of the FES because of its criterion for excluding all isotopes having less than a stated concentration.[42] As to his points regarding Table 3.3 of the FES, Staff Witness Kastner explained that the criterion for excluding isotopes by concentration level was selected after studying the biological risks associated with the excluded isotopes and determining that their contributions would be negligible.[43] The Board accepts the explanation of the Staff as reasonable and hereby modifies the FES accordingly to incorporate the above explanation of Table 3.3 as given by Witness Kastner in his testimony.

18. During the course of the hearing, Intervenor's counsel alleged that dose calculations to milk consumers were not performed properly and that he wished to provide independent calculations.[44] The Board, in seeking to develop the record fully, provided several opportunities to the Intervenors, made over objections of other parties, to present such data and calculations.[45] However, none were produced. Population doses were calculated by the Applicant and Staff by using available cow census data.[46] Upon the Board's inquiry as to the location of the nearest cow, Applicant and Staff noted that their calculations were based on the nearest cow being 7.5 miles from the proposed facility.[47] The Environmental Protection Agency, commenting on the Draft Environmental Statement, noted a nearest potential pasture at two miles and calculated that a cow pastured there might result in a thyroid dose of 40 mrem/yr for a six-month old infant.[48] Applicant has agreed to the EPA suggestion of monitoring the actual locations of cows during plant operation, and the Board hereby makes this a condition of whatever authorizations flow from this Partial Initial Decision.

19. In addition, Witness Morgan questioned whether dose calculations should be restricted to persons within a 50-mile radius and not extended to include other persons who consume food produced within that radius.[49] However, the record indicates that Staff Witness Baker calculated the milk dose both ways.[50]

[41] Tr. 2887-8, 2905, 3149.
[42] Tr. 3150-51.
[43] Tr. 3210, 3214, 3216, 3235.
[44] Tr. 174, 185.
[45] Tr. 197, 241, 243, 452, 682, 1275.
[46] Tr. 2215, 2387; Witness Baker, Table A1.
[47] Tr. 2177-2180, 2215.
[48] FES pp. 11-9, A-14.
[49] Note 32, p. 1; Tr. 2832, 3065.
[50] Note 27, pp. 5, 6, A-1, A-2.

The former method yielded the higher dose and was therefore adopted by the Staff for conservatism.[51]

20. Witness Morgan questioned several facts and procedures used by the Staff, asserting that: (a) The I-131 dose could be calculated more accurately by means of a three-component model proposed by the International Commission on Radiological Protection.[52] However, this model has not yet been published, although the material is supposedly available through Oak Ridge National Laboratory.[53] With respect to I-131, Witness Morgan first stated that the improvement in accuracy would be less than five percent but later modified this conclusion and stated that he would be surprised if it were only five percent.[54] (b) The Staff's formula for the genetically significant dose (GSD) was incorrect. He offered an alternative formula.[55] Staff Witness Bender stated that Dr. Morgan's proposed alternative formula is proper in some circumstances, such as a retrospective study, but inappropriate for a future population such as the one in question.[56] In this regard Witness Morgan stated that the calculated GSD should have been multiplied by 30 to account for accumulation up to the mean age of reproduction.[57] Staff Witness Bender stated that he had properly accounted for this factor of 30 in converting generation doses to annual doses.[58] (c) The choice of whole body dose to approximate the GSD was not being conservative.[59] Witness Bender replied that this choice was conservative because no significant amounts of radionuclides known to concentrate in the gonads would be discharged from the St. Lucie facility.[60]

21. The genetic effects listed in Contention 1.2 were examined by witnesses for the Applicant[61] and for the Staff.[62] They concluded that the total genetic risk is almost entirely determined by the exposure of plant personnel, and the resulting increase in ill health is estimated as between 0.0001% and 0.001%. The increased probability of genetic harm to offspring of plant personnel was estimated as 0.01% to 0.16%[63] by Applicant and as 0.03%[64] by Staff.[64] These

[51] Note 27, p. A-2.
[52] Witness Morgan, see note 32, p. 1; Tr. 3064.
[53] Tr. 3069.
[54] Tr. 3071.
[55] Testimony of Karl Z. Morgan following Tr. 2830, p. 2; Tr. 3121.
[56] Tr. 3196-97.
[57] See note 32, p. 1.
[58] Tr. 3198.
[59] Tr. 2889-94.
[60] Tr. 3198-3202.
[61] See note 20, pp. 8, 9.
[62] Reader, p. 6.
[63] See note 20, p. 10.
[64] Bender, pp. 6, 7.

figures are percentages of the 6% natural incidence of genetic defects, so that the percentage of incidence would rise from 6.0 to 6.0018%, or to 6.0036% if the dose were doubled.[65]

22. The somatic risk to consumers of milk, cited in Contention 1.2(c), was estimated by the Applicant[66] and by the Staff.[67] The former estimated a maximum of one extra case of thyroid cancer in 20 years; the latter estimated less than one case in 110 years. Thyroid dose is considered to be the critical factor. As to cows' milk, it is estimated as less than 2 mrem/yr for both Units 1 and 2 combined.[68] As to a mother nursing a small child and eating 72 kg/yr of leafy vegetables from a garden at the nearest residence, she would receive an estimated maximum thyroid dose of 1.4 mrem/yr.[69] Assuming that 30% of the mother's radioiodine intake is transferred to her milk, the nursing child would receive an estimated thyroid dose of 3.5 mrem/yr.[70]

23. With respect to Contention 1.2.1, witnesses for Applicant testified that general predisposition to develop cancer appears to be nonexistent; that a genetically determined predisposition in certain individuals has been postulated, but only in theory;[71] and that the risk to susceptible persons from other carcinogenic factors far outweighs any risk from the St. Lucie facility.[72] The Staff likewise concluded that there is no evidence that affected persons are more susceptible to induction of carcinoma by radiation and that health effects will be negligible.[73]

24. Without advancing calculations or numerical comparisons and without suggesting any basis in the Commission's rules or regulations requiring same, Intervenor Witness Morgan asserted that "dose commitments"[74] should be calculated and used for the St. Lucie 2 facility, as well as for nuclear facilities in general. While such a proposal was not considered within the Commission's Rules and Regulations and considered not necessary to the rendering of this Decision, the Board is of the opinion that the proposal merits further review and evaluation. Accordingly, the parties are advised that the Board will receive evidence on this subject during the health and safety phase of this proceeding.

[65] Tr. 2638-39.
[66] See note 21, p. 3.
[67] See note 29, p. 1.
[68] FES p. 5-15; Rodger Table 21; Tr. 2131.
[69] FES p. 5-17.
[70] Id., Tr. 2535-36.
[71] See note 22, pp. 5, 6.
[72] Id., p. 7.
[73] Bender, pp. 8, 9.
[74] See note 32, p. 2; Tr. 3083-88.

25. Witness Morgan stated that there is no dose of radiation so low that the probability of radiation damage would be zero.[75] He asserted that the linear hypothesis for extrapolating from high dose to low dose may not be conservative.[76] However, witnesses for all parties agreed that they have used, or would use, the linear hypothesis.[77] The Board accepts the linear hypothesis as a basis for the Staff's conclusions but notes that there is disagreement regarding the importance of "uncertainties".

26. Witness Morgan questioned[78] the Applicant's health physics program described in Section 12 of the Preliminary Safety Analysis Report[79] and summarized at p. 12-5 in the Safety Evaluation Report.[80] The Board will inquire in greater detail into the health physics program at an appropriate time during the health and safety phase of this proceeding and accordingly defers any ruling thereon at this time.

27. Intervenors contend that the estimated dose of 15 man-rem per year from fuel transportation to and from the site (both units) is too high[81] and proposed shipment of fuel by barge as an alternative. There was other testimony, however, to the effect that there is no assurance that reprocessing facilities will be able to handle barge shipments.[82] The issue raised deals with direct radiation from shielded fuel elements in transit and does not appear materially relevant to Contentions 1.1, 1.2, and 1.2.1, which deal with radioactive effluents from the plant. The Board permitted some testimony on this point until it became clear that there was no material issue at this environmental phase of the proceedings.

28. Witness Morgan asserted that the estimated dose to plant personnel is much too high.[83] The Staff estimate for a typical plant is 450 man-rem/yr, including nonroutine events, based on operating experience.[84] While Applicant's calculations for St. Lucie Unit No. 1 were cited as 75 man-rem/yr,[85] nevertheless the figure of 450 man-rem/yr was adopted by the Staff in the FES. Both the Applicant and Staff used 450 man-rem/yr in calculating genetic effects of radwaste in an effort to be conservative. The Board expects the Applicant to apply the principle of keeping occupational exposures, as well as exposures to

[75] See note 32, p. 4.
[76] Id., p. 7; Tr. 2848-49.
[77] Thiessen and Linnemann, note 20, p. 3, Tr. 2[illegible]; Bender, p. 3, Tr. 3560; Morgan Tr. 3106, 3121, 3139, 3157.
[78] See note 32, p. 2; Tr. 2880, 3088.
[79] Applicant's Exhibit 2.
[80] SER following Tr. 3344.
[81] See note 32, p. 3; Tr. 2833.
[82] Tr. 3100-02.
[83] See note 32, p. 3; Tr. 2895, 2902, 3103, 3126.
[84] FES p. 5-22.
[85] Tr. 2481, 2902.

the general population, "as low as practicable". The Board concludes that 75 man-rem/yr is a reasonable, practicable level and hereby makes it a condition of this license.

29. In connection with his testimony on waste treatment systems, Applicant's Witness Rodger was asked by the Board as to whether he had considered the possible effects of using recycled plutonium fuel in St. Lucie Unit No. 2.[86] There is no testimony of record that such fuel will be used in St. Lucie Unit No. 2. The question simply arose in the context of a discussion about the leakage of radioactivity into the primary coolant and was answered by the witness to the satisfaction of the Board.[87] Subsequently, Intervenor's counsel sought to raise a new issue in this proceeding of whether the Applicant intended to use recycled plutonium in St. Lucie Unit No. 2.[88] The Board ruled that the issue was not relevant to the application under review, was not germane to the proceedings, and was being raised for purposes of delay only.[89]

30. The Board considered it significant that witnesses for the Applicant and Staff agreed that the expected radiological effects do not affect the cost-benefit balance for St. Lucie Unit No. 2[90] and that Intervenors' expert Witness Morgan believes that, even with the alleged risks, the expected benefits outweigh the expected costs.[91]

31. Based on the evidence of record, including contradictory testimony as to Contentions 1.1, 1.2 as amended, and 1.2.1, the Board finds that radioactive effluents from the proposed St. Lucie Unit No. 2 will be "as low as practicable" and that any such releases will not materially affect the cost-benefit balance in favor of the proposed facility.

Contention 1.3

Contention 1.3 reads as follows:

Whether sufficient need for power will exist to justify the present construction of the facility, particularly whether:

(a) the projected reserve margin without the facility would be adequate;

(b) conservation measures by consumers due to changes in the rate structure designed to reduce the demand for electricity including peak pricing and higher overall prices will eliminate or postpone the need for the facility;

[86] Tr. 2181, 2487.
[87] Tr. 2164-66; Tr. 2181-82, 2187-88.
[88] Tr. 2855-64, 2869-78, 3053-55, 3362.
[89] Tr. 2856-57, 2872-73, 3035, 3054-55, 3362.
[90] See note 20, p. 1; note 21, p. 4; note 22, p. 7; Bender, p. 9.
[91] Tr. 3127, 3174.

(c) whether or not there shall occur in the future a slowed rate of economic growth in Florida, which would reduce the need for power;

(d) whether there are power pools for Applicant to join; and if so, by joining such pools, whether its reserve needs would be diminished sufficiently to eliminate the need for the facility;

(e) conservation of electricity by Applicant's customers due to increased rates presently occurring.

32. As to Contention 1.3(a), forecasts of reserve margins in 1980 were made by Witness Bivans and Witness Beyer. Witness Bivans testified that demands from 1957 through 1973 have increased at the rate of 13 to 14% per year. This is approximately twice the national average. The rate first projected by the Applicant for the period up to 1981 was an 11.3% annual rate of growth of peak demand. Recent changes in patterns of energy use and costs make it necessary to assume that historical patterns would not continue. Plans were therefore developed for additional generating units which will accommodate a band of growth rates of from 7 to 11%.[92] The 7% minimum growth rate figure took into consideration all adverse factors affecting growth.[93] It was Mr. Bivans' testimony that a reduced rate of growth would not affect FPL's need for St. Lucie 2 as a base load generating facility at the earliest possible completion date.[94]

33. Witness Beyer testified that he had conducted an analysis of the Applicant's system from records supplied by the Federal Power Commission and the Southeast Electrical Liability Council and had made a loss-load probability study of the Applicant's system. Witness Beyer testified that the Applicant's system as planned with St. Lucie Unit No. 2 would experience a loss of load of 1.10 hours during a peak week in 1980. Without the capacity of St. Lucie 2, the loss-load would be increased to 3.46 hours during such a peak week. This loss of load period was in excess of the Applicant's operational criterion. Thus Beyer concluded that the added capacity of St. Lucie 2 was needed to provide adequate reserves.[95] Intervenor provided no direct case on this subject but through cross-examination showed that in July 1974 the rate of increase per kilowatt-hour of sales was only 1% greater than in the previous year.[96] Applicant's Witness Bivans testified that, in June, July, and August of 1974, actual consumption was less than in the previous year, but in March, April, May, and September it had been slightly above the previous year. Thus the net increase for 1974 would be approximately 2%.[97] For the 2% cumulative

[92] Witness Bivans following Tr. 383, p. 7.
[93] Id., p. 9.
[94] Id., pp. 15, 16.
[95] Witness Beyer following Tr. 604 at pp. 16, 17.
[96] Tr. 406.
[97] Tr. 399, 404, 408-409.

increase in sales, there was a corresponding 5.2% increase in peak load. Questioned as to why a minimum peak load projection of 7% and a maximum projection of 11% could be justified when the 1973 to 1974 increase was only 5.2% in peak load and approximately only 2% in gross kilowatt-hour sales, Bivans testified that the summer of 1974 figures were anomalous because of unusual weather conditions. An additional 200 megawatts peak load would have been required if the weather had been normal. He also indicated that there were 7% more customers in 1974 than in 1973 and thus the minimum 7% figure could be justified even in terms of the 1973-1974 data.

34. The Board after reviewing the entire record, and based thereon, is persuaded that projected reserve margins would not be adequate without the proposed facility. Using even the most conservative projected demand forecasts, the Board is convinced that the St. Lucie 2 unit is required to meet needs in the year 1980.

35. As to Contention 1.3(b), Applicants and Staff presented direct testimony. Applicant's Witness Guth made a detailed projection of FPL's needs for both commercial users and residential sales. His projections took into consideration price elasticities and projected incomes, appliance saturation, expected saturation trends, and competitive fuels.[98] His projected demand, considering residential, commercial, and industrial sales, was from 7.3 to 11.1%. This agreed with the range set forth above by the Applicant.[99] Witness Guth testified that a refinement in the rate structure would not have a major impact upon load. Adjusting the rates upwards during peak periods for peak period usage in his opinion would have more impact upon total energy sales than on systems loads and therefore would be ineffective in improving load factors.[100] Witness Guth argued that all available evidence suggested that demand during peak periods was less responsive to price than demand during off-peak periods. Thus Guth forecasts that the chances for a deteriorating average load factor through 1980 were much greater than chances for an improving load factor.[101]

36. Staff Witness Uhler felt that there were possible shortcomings in the present rate structure but that the concept of peak load pricing needed scrutiny.[102] Uhler, however, concluded that consumer responses to changes in rate structure are not yet well known; the effects upon demand are speculative.[103] He testified that pricing effects always involve a period of lag between a decision of a price change and consumer response.[104]

[98] Witness Guth following Tr. 381, pp. 1-48.
[99] Id., p. 48.
[100] Id., p. 50.
[101] Id., pp. 49, 50.
[102] Testimony of Witness Uhler following Tr. 601, p. 32.
[103] Id., p. 34.
[104] Id., p. 27.

37. Applicant's Witness Gerber testified that climatic conditions and need in Florida were such that peak load pricing would not likely be effective in this situation although it might be in other localities.[105] Gerber pointed out that, since peak periods of usage are extended over so many hours of the day and so many days of the year in Florida, there is no place to shift use. Even though some demand might be shifted away from the peak period, the same energy would be required and the effect would result in a higher load factor, which would justify even more base load nuclear capacity. Gerber also concluded that the uncertainties associated with peak load pricing, the cost of metering, the problem of communication to the consumer of information regarding the peak, and other unresolved problems would prevent implementation of such a policy at this time.[106]

38. After considering all the evidence of record, the Board concludes, based thereon, that a rate structure change would be ineffective at this time towards materially reducing demand.

39. Contention 1.3(c) was addressed through direct testimony by Applicant Witness Gerber and Staff Witness Uhler. Their responses indicated that a slower rate of economic growth in the future would not reduce the need for power. Witness Gerber cited the following reasons for the past growth of electricity in Florida: (1) a rising standard of living, (2) population growth, (3) rising levels of economic income, and (4) general economic expansion.[107] Witness Gerber, however, did not believe that the past growth rate in the use of energy would persist in the FPL area in 1980. He projected a basic growth thrust for the FPL area though at a more moderate rate than in the past.[108] The basis for the continued growth in demand was the 3.78% annual population increase, of which 3.35% was accounted for by migration. He also projected continued population growth because of continued commercial and industrial employment opportunities, as well as the expectation of increased migration of people with retirement incomes. The rate of growth of population between 1970 and 1980 was projected to be 3.3% and was projected to decrease to 2.5% in the succeeding decade.[109] Gerber projected that real personal income in the 1969-1980 period would increase at the rate of 6.1% in Florida vs. a 4% nationwide average. Similarly higher manufacturing earnings were projected for Florida. The effect of these economic changes would be that the projected annual increase of power sales of FPL would decrease from the 14.5% between 1950 and 1973 to an annual average growth rate of 10.1% between 1973 and

[105] Testimony of Witness Gerber following Tr. 461, p. 28.
[106] Id., pp. 28, 29.
[107] Gerber, pp. 10, 11.
[108] Id., p. 18.
[109] Id., p. 13.

1980.[110] Gerber felt that the present economic recession, the high interest rate, and unemployment would cause a temporary decline in real income; that such adverse economic conditions would not persist long term; and that it would be unreasonable to base a projection of 1980 energy requirements upon a continuing recession.[111]

40. Staff Witness Uhler's testimony was in substantial agreement with the testimony of Witness Gerber, i.e., that economic conditions in Florida would not reduce the demand for power sufficiently to postpone the need for the facility. He forecast higher than average real per capita incomes in Florida.[112] Expanded population, personal income, and economic activity would not substantially decrease the demand for power. Although there are offsetting factors (life-styles, energy prices, and national policies) that tend to cloud forecasts, based on historic relationships, Uhler believed the data indicated an economic expansion that will be associated with a significant increase in demand for electric services.[113]

41. While Intervenor presented no direct testimony on this contention, he attempted to show through cross-examination that the present recession together with the declining tourist industry in southeastern Florida would have some impact upon future power needs. Witness Uhler's testimony, however, indicated that, although tourist expenditures were down from the previous winter,[114] there were definite indications of expanded economic activity in Florida.

42. Based on the uncontradicted preponderance of evidence in the record, the Board finds no evidence of a slowed rate of economic growth which would postpone need for the Florida plant.

43. As to Contention 1.3(d), the Board noted that Applicant's Witness Bivans testified that, although there is a present possibility for load sharing within the State of Florida, load sharing with other states must await transmission network ties to units in Georgia. Although such ties have been proposed, even if such a large high voltage connection grid were completed, it would only reduce to a small degree the requirements for daily operating reserve and would not reduce the requirement for installed reserves.[115] Bivans testified that the numerous interconnections with other utilities in the State of Florida operate on a voluntary basis, that standby reserves are available in an emergency, but that there are no formal power pools within the state. The out of state

[110] Id., p. 18.
[111] Id., p. 21.
[112] Uhler following Tr. 601, p. 20.
[113] Id., p. 23.
[114] Tr. 624.
[115] Witness Bivans following Tr. 383, p. 20.

interconnection is through an intermediary (Florida Power Corporation) which has interties with the Gulf Power Company.[116] Witness Bivans testified that he was actively pursuing additional interconnections with Georgia Power Company but that such interties would not reduce the reserve requirements.

44. Intervenor through cross-examination of Witness Bivans explored the possibility of purchasing power from companies both within and outside the State of Florida.[117] However, Bivans testified that no firm power was available for sale from these companies at the present and that only emergency power could be purchased from other utilities.

45. While it was apparent that FPL had made little or no effort to interconnect with other utilities for the purpose of sharing power, nevertheless the Board finds no indication from the testimony or cross-examination that joining other power pools was a viable option at the present time which would eliminate the need for the proposed facility.

46. Contention 1.3(e) related to the influence of recent price changes and surcharges that were made in Florida to compensate for the increased cost of fuel oil following increased oil price by the oil cartel. It was addressed by Applicant's Witnesses Guth and Gerber and by Staff Witness Uhler. Witness Uhler's testimony indicated that it is possible to demonstrate changes in consumption in Florida resulting from the price increase imposed because of the cost of residual fuel oils. Uhler's analysis of the Florida data, however, indicated that 10% expansion in sales took place in spite of a 10% increase in price. His analysis also indicated that there was some growth in sales even though prices were 30% higher.[118] Thus, short term data available from Florida does not support a conclusion that conservation will reduce need for the plant.[119]

47. Witness Guth did not analyze directly the effect of the recent surcharge in Florida upon demand. Although Guth stated that there is no firm evidence on the point where the magnitude of price elasticity will be different in periods of rising real prices, he suggests that a range of price elasticity for net usage could be from −0.5 to −0.7.[120] However, considering other factors, such as income elasticity, annual average changes in electricity price, and personal income, Guth concludes that there will be a minimum rate of growth in net usage per customer in the amount of 0.5% annually; a most optimistic case would give a 5.0% annual increase in the rate of growth of customer usage.[121] Thus Guth predicts that the net effects of price elasticity will be partially overcome by other

[116] Tr. 533.
[117] Tr. 536, 537.
[118] Uhler, p. 40.
[119] Id.
[120] Guth, p. 29.
[121] Id., p. 32.

considerations.[122] Witness Gerber testified that, although some conservation may result from increase in prices, more efficient appliances, better insulation, and reduced lighting standards, such opportunities for savings are limited and would be realized gradually over a period of years. However, he did not feel that energy prices would tend to lower the rate of growth of energy consumption in view of the growing population and rising income levels which bring about a trend in the opposite direction.[123]

48. Apparently only Staff Witness Uhler had looked at the most recent FPL data after imposition of surcharges resulting from the increased price of residual fuel oil from the oil cartel. Although price appears to have affected demand, there is no clear-cut evidence that in the long run there would be significant decrease in the demand. In response to Board questioning, Witness Guth on the other hand testified that it is too early to study the effects of the fuel adjustment upon demand since it was complicated by inflation and other short run problems.[124] Thus, although there was some doubt as to the ultimate effect of price increases, the Board finds no material showing that the effect of such increases would be sufficient to obviate the need for the St. Lucie 2 plant.

49. Generally with respect to Contention 1.3 the Board finds that the specific subcontentions were in many ways made moot by uncontradicted testimony offered by Witnesses Gerber and Uhler which indicated that recent increases in price of competitive fuels for nuclear generating plants (a) make nuclear fuel the most economical choice, and (b) make nuclear fuel more certain, considering recent difficulties experienced in obtaining residual fuel oils. Witness Gerber testified that the St. Lucie Unit No. 2 nuclear plant could be justified on the basis of fuel savings by substitution for residual oil fired generation, even if the increased capacity of this unit were entirely surplus. This testimony thus makes moot all arguments regarding the precise percentage rate of increase in demand for Florida during the period of construction of St. Lucie Unit No. 2. Gerber testified that substitution of nuclear fuel would result in $140.2 million savings in excess of the annual fixed charges for the unit even if the capacity were entirely surplus.[125] During cross-examination and in response to questions by the Board, Gerber reduced the projections of savings by approximately $19 million due to increase in capital cost of the plant not taken into account in his prepared testimony.[126] Witness Uhler testified that utilities such as FPL which are heavily dependent upon residual fuel oil are in a unique position in regard to the construction of nuclear power plants since the

[122] Id., pp. 31, 32.
[123] Gerber, pp. 22, 23.
[124] Tr. 568.
[125] Gerber, p. 26.
[126] Tr. 579.

availability of such residuals is not secure.[127] Uhler testified that the Presidential Message to Congress had specifically said that new base load plants should not burn oil.[128] Uhler further testified that the supply of natural gas which FPL receives from United Gas pipeline experienced the most serious curtailment problems of all jurisdictional pipelines of the Federal Power Commission.[129] He further testified that the uncertainty of coal cleanup technology and the fact that FPL has little experience in burning coal would restrict the possible alternatives open to FPL at this time.[130] Questions directed by the Board to Witness Uhler reinforced the suggestion that there was a possibility that oil would not be available to base load units.[131] Thus, with respect to competitive fuel availability and cost, the Board finds that there appears to be a continuing strong justification for construction of St. Lucie Unit No. 2 as a nuclear plant.

Contention 1.6(c)

50. Contention 1.6 relates to alternative energy sources, alternative sites, and alternative ultimate heat sinks. Contentions 1.6(a) and 1.6(b), dealing with alternative energy sources and sites, were summarily dismissed.[132] Contention 1.6(c) states:

> Whether the Staff's Final Environmental Statement has sufficiently considered alternatives to the proposed action including:
>
> (c) alternative ultimate heat sink methods such as auxiliary ocean intake or wet or dry cooling towers using salt or fresh water or treated sewage effluent.

51. The Applicant[133] and Staff[134] presented testimony on alternative ultimate heat methods. One alternative is an auxiliary ocean intake. Staff Witness Young noted that an event that would block the main intake canal would also block the auxiliary intake if of similar design.[135] Wet and dry cooling towers were found by the Staff to cost more and to have susceptibility to storm damage over the proposed system.[136] The Staff considered a cooling lake and found the environmental impact on the island to be greater than the

[127] Tr. 636.
[128] Tr. 635.
[129] Id.
[130] Tr. 636.
[131] Tr. 643, 644.
[132] See paragraph 5, *supra*.
[133] Testimony of J. R. Fotheringham following Tr. 2086.
[134] Testimony of John Young following Tr. 2087.
[135] Id., p. 2.
[136] Id., p. 3.

proposed design.[137] The use of treated sewage as a coolant was considered by both Applicant and Staff witnesses who agreed there is no source for such sewage.[138] In addition to a higher economic cost, Witness Fotheringham considered that the environmental costs of a 1200 ft. jetty and a 400 ft. wide channel would be excessive.[139] He also testified that towers would require more space, with the attendant environmental effects, than the present system which is going to be used by Unit No. 1 in any event.[140] Following review of the entire record on alternatives considered, the Board finds that the Applicant and Staff have considered alternative heat sink methods. The Board concludes that the proposed system using Big Mud Creek is the best alternative both from the standpoint of cost and environmental impact.

Contention 2.1(b)

> Whether the proposed site meets the requirement of 10 CFR Part 100 as to meteorological conditions including:
>
> (b) whether hurricanes pose such a severe threat to the safe operation, due to their accompanying land erosion, high winds and storm surges, and their resultant effect on the site, its equipment, buildings and the intake water canal and emergency cooling canal and means of ingress and egress, that the site is unsuitable.

52. All three parties presented direct testimony on this contention. In weighing and evaluating conflicting evidence, the Board took into consideration the fact that each of the witnesses offered had different backgrounds and different expertise. Staff Witness Lewis G. Hulman is primarily a hydraulic engineer with experience in hurricane damage from a hydrologist's standpoint with an understanding of water movements, soil erosion, erosional effects, and surges. Applicant's Witness Fei-Fan Yeh also has a background in hydrological engineering and is well qualified to make an assessment of erosional damage arising from waves and water movements. However, the Board found that Dr. Yeh had a limited understanding of hurricane behavior and was not an expert in hurricane characteristics. Since Witnesses Hulman and Yeh had limited backgrounds in meteorology, they did not appear qualified to use an analog methodology in predicting hurricane intensity and effects. Intervenor's Witness Arnold L. Sugg, on the other hand, obviously had widespread experience as to the meteorological characteristics of hurricanes and their wind speeds and surge heights, and he has had practical experience witnessing erosional effects. By

[137] Id., p. 4.
[138] Id., p. 4; note 128, p. 4.
[139] Note 133, pp. 2, 3.
[140] Id., p. 4.

virtue of his experience with past hurricanes in Florida. Witness Sugg is qualified to make some general judgments and predictions of hurricane damage; however, the Board gave little weight to Mr. Sugg's testimony on assessment of rates of erosion damage or the specifics of soil, vegetation, and beach and water conditions relating specifically to the St. Lucie site.

53. The maximum probable hurricane (PMH) used in the analysis of the Staff and Applicant is a hypothetical storm defined by certain criteria furnished by the U.S. Department of Commerce.[141] This storm has intensity characteristics (central pressure) lower than the other "great" hurricanes that have struck the United States. As regards central pressure, it is slightly more intense than Hurricane Camille and slightly more intense than the Labor Day hurricane of 1935 at Key West. In assessing the effects of the maximum probable hurricane, Staff and Applicant witnesses made assumptions regarding the trajectory of the storm in relation to the coastline which would maximize the storm surges, wind, and wave activity.[142] On cross-examination, the Intervenor's witness first testified that the maximum probable hurricane postulated by the Applicant was more intense than most of the "great" Florida hurricanes with the exception of Hurricane Camille.[143] Later during cross-examination, Witness Sugg stated that the difference between the maximum probable hurricane and Hurricane Camille was of little or no significance.[144] Thus, there appears to be little difference in the opinion of experts as to the intensity and trajectory factors used in the calculations of the Applicant and Staff, and there are really no facts in dispute.

54. There was no direct testimony offered by either the Staff or the Applicant upon the effect of the duration of possible hurricanes in the vicinity of St. Lucie 2. This question arose during cross-examination of Applicant's Witness Yeh by the Intervenor and through direct and cross-examination of Intervenor Witness Sugg.[145] The maximum probable hurricane hypothesized in the Intervenor and Staff testimony did not consider the possibility of a hurricane stalling in the vicinity of the plant so that storm surge, wave, and wind erosional effects would persist for several days. Witness Sugg testified that storms can stall and remain approximately stationary for as long as 4 days.[146] He further testified that, when a tropical storm decelerates or slows down in this way, it increases in intensity, and he cited examples within his experience of tropical storms which had performed in this way and ones which had essentially

[141] Witness Hulman following Tr. 1688, pp. 5-6.
[142] Hulman following Tr. 1688, p. 6; Yeh, following Tr. 1838, p. 2.
[143] Tr. 2050.
[144] Id.
[145] Tr. 1915, 1922, 2069-72.
[146] Tr. 2069, 2070.

had a loop configuration whereby they struck a given area twice.[147] Thus, Sugg's testimony indicated that hurricanes could stall offshore in the warm water of the Gulf Stream, could increase in intensity,[148] and could thereby affect the St. Lucie coastline for a period up to 4 days. During such time winds would be of gale, and possibly of hurricane, force category.[149] The Board could find no evidence in the testimony of Witness Hulman or of Witness Yeh to indicate that there had been any consideration given to the stalled hurricanes hypothesized by Witness Sugg. Witness Yeh testified that, if the maximum probable hurricane stalled, the wind velocity would decrease.[150] This was in direct contradiction to a statement by Witness Sugg who had testified that a first rule in hurricane forecasting was that deceleration of hurricanes was accompanied by an increase in intensity.[151] Examination of Witness Yeh by cross-examination and responses to questions of the Board indicated that this witness had little or no direct knowledge of stalled hurricanes and hurricane trajectories and speeds[152] but seemed to have relied heavily upon other sources of information for his testimony in these areas. Under examination, he stated that a hypothesized, stalled hurricane could be more damaging than the probable maximum hurricane used in his analysis.[153] Since Witness Hulman did not directly address this matter, the testimony of Witness Sugg appeared to the Board to be more responsive on this point.

55. As to the question of hurricane surges, the Applicant estimated the maximum surge level for the PMH to be 16.2 ft. mlw.[154] while the Staff's surge estimate was 16.7 ft. mlw.[155] Witness Hulman testified that, with severe breaching of the island in several places, wave run-up on the ocean side of the plant island would reach a maximum level of +22 ft. mlw.[156] He further testified that the Applicant had been requested to provide for sandbagging and stop-log closure structure to minimize any potential leaking to the +22 ft. level.[157] Witness Yeh testified that the maximum peak storm surge and wave run-up with a maximum PMH storm would not exceed +19 ft. mlw. but that all safety features would be protected to the +22 ft. mlw.[158] His calculation of

[147] Tr. 2070.
[148] Tr. 2069.
[149] Tr. 2071.
[150] Tr. 1911, 1936.
[151] Tr. 2069.
[152] Tr. 1909-1915, 1936-38.
[153] Tr. 1909.
[154] Yeh, p. 2.
[155] Hulman, p. 8.
[156] Id., p. 11.
[157] Id.
[158] Yeh, p. 2.

surge run-up assumes a tide of 3.7 ft. and an initial surge of 1.5 ft. for a combined total peak of PMH surge of 16.2 ft. mlw. Thus the Staff's witness and the Applicant's witness differ somewhat in the calculated elevation of water and wave run-up during the maximum probable hurricane. Witness Yeh explained that the difference in these calculations was due primarily to the fact that the Staff had not taken all topographic conditions into consideration in calculating a 22 ft. mlw. wave run-up. His calculations of 19 ft. reflected the "real" topographic configuration of the area.[159]

56. Witness Sugg testified that Hurricane Camille had surge levels at Pass Christian, Miss., of 24.6 ft.[160] Witness Hulman also testified that the Hurricane Camille at Pass Christian had a surge level of 23 ft. with a run-up to 25 ft.[161] However, further testimony and cross-examination indicated that surges of this height were not possible in the St. Lucie area because of the configuration of the Continental Shelf. In the case of Camille striking the Mississippi Gulf Coast, the shallow offshore shelf accounts for the extremely high surge height.[162] Witness Sugg agreed that the shallowness of the Continental Shelf was a factor in determining surge height.[163] He acknowledged that, all other things being equal, the surge height at Hutchinson Island would be less than at the Texas Gulf Coast.[164]

57. Thus, no substantial evidence was developed in the record to indicate that the storm surges would exceed the level recommended by the Staff for protection of the plant (+22 ft. mlw.). Records of higher surges appeared to have occurred only in areas with much shallower shelf configurations than Hutchinson Island. In view of the substantial evidence in the record in support of the designed protection level, the Board concludes that the hurricane surge analysis is adequate.

58. With respect to beach and island erosion factors, all expert witnesses (Hulman, Yeh, and Sugg) agreed that severe hurricanes would breach the dune and erode the area between the ocean and the plant site. Witness Hulman testified that the dune would be breached and washed away and that much of the sand between the present waterline and plant nuclear island would virtually disappear in a severe hurricane.[165] Witness Yeh hypothesized a 6-hour erosional attack on the dunes by waves which had a height varying from +8 to +14 ft. and calculated an average erosion of 50 cubic yards per foot of shoreline. This would

[159] Tr. 1846.
[160] Sugg following 2000-B, p. 1.
[161] Tr. 1711.
[162] Tr. 1713, 1714.
[163] Tr. 2027.
[164] Id.
[165] Tr. 1690.

bring about 150 feet of horizontal recession with a surge level of 16.2 ft.[166] He believed there would be virtually no foreseeable erosion of the plant island.[167] Yeh further testified that there would be little erosion at the plant elevation level (18 ft.) because the wave energy would be dissipated when the wave was broken at the highway.[168] There would be little energy to create erosion in the area near the plant. His calculations indicated that a 10 ft. wave would erode approximately 5 ft. of material from a 150 ft. strip beyond highway A1A. Witness Yeh's calculation of the erosion that would take place beyond the highway with 16.2 ft. surge (150 ft. horizontal recession) he believed to be conservative. However, his testimony indicated that (a) there was a difficult scale problem in making such estimates;[169] (b) only erosion arising from wave run-up would occur beyond the 150 ft. recession behind the roadway; (c) flowing water at the parking lot would be approximately 2.3 ft. deep;[170] and (d) wave run-up beyond the 18 ft. level of 1 ft. would create flooding at the perimeter of the plant island.[171] In cross-examination, Witness Yeh considered a hypothetical storm which had stalled in the area so that there was flow around the plant island at the hypothesized surge level (16.3 ft.). He estimated that this would give a water depth near the island of 2 to 3 ft. and, with a long duration storm, would give 1 to 2 ft. of scour. This would not bring about cutting of the island.[172] Witness Hulman indicated that, with a breach of the island at Big Mud Creek, there would be erosion at the vicinity of the site[173] but that even with such a breach the nuclear island would not be eroded to the extent that would constitute a threat to any of the safety related structures.[174]

59. In view of the entire record, including consideration of conflicting evidence therein, the Board concludes that ample evidence exists to indicate that the hypothesized maximum probable hurricane would not create sufficient erosion to threaten the plant and safety related structures even though water completely covered the island. However, the Staff apparently did not consider the situation postulated by the Intervenor's Witness Sugg (erosion taking place for a period of 4 days). Thus there remains an area of uncertainty concerning damage in a situation in which several days of erosion from a maximum probable hurricane stalled offshore followed by this hurricane moving inland and producing a wave run-up to the height proposed by Hulman (22 ft.). However,

[166] Yeh, pp. 3, 4; Tr. 1873.
[167] Yeh, pp. 3, 4.
[168] Tr. 1877.
[169] Tr. 1872, 1873.
[170] Tr. 1875.
[171] Tr. 1878.
[172] Tr. 1922.
[173] Tr. 1704.
[174] Id.

the Board concludes that, even with the most severe hypothesized situation, structures protected to +22 ft. would not be threatened beyond that indicated by analysis and calculations already completed. With respect to the integrity and safety of the plant itself, the Board is persuaded by Witness Hulman's testimony that safety would not be threatened even with breaching of the island and a wave run-up of 22 ft. mlw. if the Staff request that the Applicant take certain measures to minimize inleakage was carried out.[175] However, since the Staff did not formally consider stalled hurricanes and since additional protection may be required for safety related structures in the event of this type of storm, the Board directs the Staff and Applicant to specifically address the question of stalled hurricanes and their possible safety related effects on St. Lucie No. 2 at the health and safety hearings.

59a. The testimony of Applicant Witness Harris indicated that there would be no problems of ingress or egress from the plant site in the event of severe hurricanes since adequate hurricane warnings would be available to the facility. With warning, the Applicant could adequately staff the plant so that it could be kept in operation even though ingress and egress to facilities were inhibited.[176] Applicant Witness Fotheringham testified that ocean intake structures and emergency cooling water canal would be able to withstand maximum impact of a PMH and that emergency shutdown requirements could be met.[177] In reaching these conclusions, the Board expressly requires hereby that the recommendations of the Staff relative to this matter be made part of the technical specifications for any construction permit authorized pursuant to this decision. Subject thereto the Board finds that the site meets the applicable requirements as to meteorological conditions.

Contention 2.2

Whether the proposed site meets the requirements of 10 CFR Part 100 as to population density and use characteristics of the site environs, including:

(a) whether Applicant and Staff have adequately considered present population and future demographic change near the site, particularly:

(1) whether increased population of Hutchinson Island resulting from high-rise, high-density condominiums and resort hotel development with larger tenant capacities;

(2) whether within the low-population zone (LPZ), real estate developments and subdivisions on the mainland three to five miles away from the proposed site which are currently more populous than Staff and

[175] Hulman, p. 11.
[176] Harris, p. 3.
[177] Fotheringham following Tr. 1839, p. 2.

Applicant estimate and whether this will result in the very high population density within the next decade far in excess of Applicant's population projections in the Environmental Report (ER) and Preliminary Safety Analysis Report (PSAR);

(3) in nearby cities of Stuart, Jensen Beach, White City, and Fort Pierce within 10 miles of the proposed site;

(b) whether Applicant's presentation in the PSAR, Figure 2.1-2, an aerial photograph of Hutchinson Island, fails to include the entire area from five to ten miles from the proposed site and the development occurring there, and whether such information is necessary to accurately assess site suitability;

(c) whether the demographic studies performed for Applicant by First Research Corporation of Miami are inaccurate and misleading and underestimate the high population in the site environs including the LPZ;

(d) whether there is a reasonable probability that appropriate measures could be taken in the event of an accident to protect residents including evacuation of LPZ personnel, particularly whether the single, two-lane highway, A1A, on Hutchinson Island;

(1) is sufficient for evacuation and access for emergency equipment;

(2) could be separated by a storm or accident at the site since the road bisects the site which would result in division and splitting up of emergency evacuation and safety efforts;

(3) would cause highway A1A traffic to bottleneck at the single bridge at each end of the island, diminishing the possibility of escape from an island in an emergency.

60. Some of the testimony on this contention was conflicting as to several aspects of population projections. In addition, and as more fully discussed below, the Final Environmental Statement was found to contain erroneous data. It was subsequently corrected with the addition of supplemental testimony from the Staff upon a showing that the error was inadvertent and did not materially change the cost benefit balance as presented in the FES.

61. Staff Witness Dr. Emile Bernard assembled available data on populations and relied on available sources to arrive at future population figures.[178] By education, Dr. Bernard is a physicist but has been employed recently (relatively short period) by the Regulatory Staff in a capacity that includes population surveys and forecasts relating to proposed nuclear power plants.[179] He was assigned in this capacity to the Staff's evaluation of the proposed St. Lucie facility after the Intervenor had advised the Staff of what appeared to be errors

[178] Bernard testimony after Tr. 904, pp. 5-7, Tr. 905; 1281; 1443, 2711.
[179] Tr. 966, 989, 995.

in the FES and ER.[180] Dr. Bernard provided both fact and opinion testimony. The Board gave considerable weight as to the former; however, since he had little or no experience in making regional planning studies, and was not familiar with the usual methodology used in planning and projections, the Board gave less weight to his opinions on population projections. Applicant's Witness Moore[181] based his testimony on relatively extensive experience over many years in population forecasts, and his familiarity with other projections of population levels in the LPZ and the surrounding area to the year 2000. Mr. Moore had made numerous short range forecasts for various business enterprises and appeared to have considerable practical experience in this area. The Board was not as persuaded by his opinions on long range trends, which tended to extrapolate on past experience only. Intervenor Witness Schmidt,[182] a professional urban and transportation regional planner, was found by the Board to be well qualified to assess the likelihood of population levels in the vicinity of the proposed St. Lucie 2 site. Witness Ament,[183] appearing under subpoena issued at the request of Intervenor, was, likewise, a professionally trained regional planner. In evaluating and balancing conflicting evidence presented by these witnesses, the Board considered the type of backgrounds needed to make judgments regarding the impact of future economic, social, and political changes upon growth and demographic data of any given area. Background in demography, transportation, economics, etc., all enter into the qualifications to make such predictions, as well as related experience, information obtained from state and local planners and public officials, and familiarity with Hutchinson Island and the adjacent area. The Board also considered the projected population levels up to the year 2020.[184]

62. The Board concludes that there is an honest disagreement among experts as to future populations in the vicinity of St. Lucie 2. The witnesses testifying on future population levels brought different skills, different viewpoints, and emphasized different sets of factors in making their projections. There is no clear-cut basis the Board can use for making a firm judgment as to which of the 3 population estimates is the more correct and which projection should be used in forecasting the population levels 40 years from the completion of the plant. Short term projections present few problems since agreement is sufficiently close among all three. It is with the long term projections that experts differ. The Board considered the most conservative judgments to have been those of Intervenor's Witness Schmidt. His projections were based upon projected

[180] Tr. 1466.
[181] Moore testimony (2.2(c)) following Tr. 764, pp. 2-3; Tr. 2967.
[182] Schmidt testimony following Tr. 1089, 1096.
[183] Tr. 1035-81.
[184] Tr. 1208.

constructions of known subdivisions up until 1990, followed by continuation of accelerated rate of growth of the area for an indefinite period, perhaps as late as 2020.[185] His forecasts were the most conservative (largest population) because he assumes (1) full occupancy, (2) high density on the island resulting from time-sharing of condominiums, and (3) exceptional growth in the area because of existing projections of transportation facilities and a transportation corridor in Florida, a concept currently considered by state planners.[186] Under questioning by the Board, Schmidt conceded that all long range planning (e.g., 20 years or more) relied very heavily upon judgments.[187] Such judgments based upon corridors and transportation theory and new ideas regarding cost sharing of condominiums, etc., must be balanced against Witness Moore's projections based upon past local experience but without indications that a full range of possible future economic or technological changes have been adequately evaluated. However, the Board after considering the entire record, concluded that the difference between these experts is largely moot in view of the testimony of Van Niel[188] and Bernard[189] and Moore[190] that projected improvements in plant design by the Applicant would allow the LPZ to be reduced to 1 mile. Even the most conservative population projections of Schmidt will meet the requirements of 10 CFR Part 100 as to population density and evacuation. A hypothetical doubling of Schmidt's projections for the LPZ apparently does not result in conflict with the applicable Commission regulations.[191]

63. With respect to Contention 2.2(d), the Board finds, as further set forth in paragraphs 69-74 below, that the Intervenor has failed to show that evacuation planning in the control area was inadequate. In view of the contention, the Board itself reviewed this subject matter but found no evidence that would persuade us to reach a contrary conclusion from that testified to by Applicant and Staff witnesses.

Contention 2.3

Whether the proposed site meets the requirements of 10 CFR Part 100 as to seismic considerations, particularly whether Applicant's seismic studies are incomplete, inaccurate, inadequate, including:

(a) insufficient evidence of lack of faults;

(b) no information on ten-foot plus offsets;

[185] Tr. 1208, 1148.
[186] Tr. 1149.
[187] Tr. 1216-17, 1230.
[188] Tr. 1514.
[189] Bernard after Tr. 2722, p. 2.
[190] Tr. 3395.
[191] See footnote 189.

(c) bore holes too far apart to detect faults;

(d) bore holes choice improper, i.e., no history submitted on bore hole selections;

(e) failure to complete into St. Lucie County the study of the postulated Martin County fault;

(f) an attempt to adequately chronicle earthquake history for three hundred years;

(g) too few blow count samples in the area 70-feet to 85-feet depth strata and whether this area shows liquefaction potential;

(h) failure to consider dynamic interaction of units 1 and 2;

(i) emergency cooling canal slide blockage potential;

(j) whether a fault exists five miles from the site and whether the fault is a capable fault.

64. Contention 2.3 relates to the geological suitability of the site. The Staff and Applicant presented direct testimony; the Intervenor did not. As stated in the FES, the site is located on the east coast of the Florida peninsula which is the land area of a much greater extension of the North American continent called the Floridan Plateau, which Plateau lies within the Coastal Plain physiographic province. The Applicant performed various geologic investigations, including a detailed survey of published and unpublished literature with geologic and structural maps and well log data, contact with geologists familiar with the structure of the St. Lucie County area, a study of U.S. Department of Agriculture Soil Conservation Service aerial photographs and Satellite photographs, and various types of field work, which included geologic reconnaissance, borings, and continuous seismic reflection profiling.[192] The Staff reviewed the Applicant's information and results of the testing programs.[193] In addition, the Staff reviewed and evaluated information received from the Staff consultants, the U.S. Geological Survey and the U.S. Coastal and Geodetic Survey,[194] and contacted those individuals who had postulated that faulting may exist in the site area.[195] The Board concludes that the Staff review was adequate and that: (1) there are no geologic features in the site vicinity representing a hazard or potential hazard to the St. Lucie facility; (2) the lineaments are not fault controlled but are depositional in nature; (3) faulting does not pass within 5 miles of the site, and surface faulting is not a potential hazard in the site area; (4) the apparent offsets which were the bases for the faulting postulated by Bermes, Lichtler, and Vernon may be due to a monoclinal

[192] Testimony of Witness G. F. Sowers following Tr. 1625, p. 2.
[193] Tr. 1674-75.
[194] Id.
[195] Tr. 1678.

flexure in the underlying strata which parallels the coastline;[196] (5) that any faults which may exist do not offset upper formations and would not be post-Miocene in age,[197] and therefore would not be capable faults within the definition of 10 CFR Part 100, Appendix A. Accordingly, the Board finds that, from a geological standpoint, the St. Lucie site meets the requirements of 10 CFR Part 100 and is suitable for a reactor of the general size and type proposed by the Applicant.

65. Contention 2.3(f)(g) and (j) questions the seismological suitability of the site. The St. Lucie site is located on Hutchinson Island in an area that was covered with dense vegetation and mangrove swamps. The in-situ soils have been removed by the Applicant and replaced with dense compacted fill.[198] The Safe Shutdown Earthquake (SSE) for the St. Lucie site is based on the seismicity of the Florida Platform of the Coastal Plain province. The Staff reviewed all the historical earthquakes in the province and concluded that an earthquake would not be expected to cause an intensity at the St. Lucie site that will exceed intensity VI on the Modified Mercalli Scale.[199] The Applicant reviewed the earthquake history of the Southeastern United States and the West Indies. Records of the U.S. Geological Survey were reviewed, as well as individual publications concerning earthquakes affecting Florida.[200] In addition, the seismicity in Florida is low, which is reflected in the tectonic structures in Florida. Although faults exist, they are old, with smaller offsets than seen in seismically active regions. Thus, the historical record shows little seismic activity.[201] The Staff concluded that the available record of 400 years of earthquake history in the St. Lucie site region, while not complete relative to smaller earthquakes, does not contain any earthquake larger than the earthquake chosen for the SSE.[202] Accordingly, based on the evidence of record, the Board finds that the earthquake history has been adequately chronicled for the past three hundred years, that the site provided a suitable foundation for Category I structures, that an intensity of VI MM is conservative, acceptable, and feasible for the seismic design of the proposed facility, and that there are no foundation conditions which would preclude the use of site for the proposed St. Lucie 2.

66. Contention 2.3(g) raised the question of whether there were too few blow count samples in the area within the 70- to 85-ft. depth stratum and whether this area shows liquefaction potential. Applicants performed 30 borings

[196] Testimony of T. Cardone following Tr. 1669.
[197] Tr. 1678.
[198] Testimony of Dr. Bernreuter following Tr. 1669, p. 2.
[199] SER 2.5.2.
[200] See note 192, or 2.3.
[201] Id., Attachment A.
[202] Bernreuter following Tr. 1669, p. 5.

in the immediate plant area.[203] The Staff's review of the boring logs submitted by the Applicant as part of the site investigation program indicated a stratum of sand located approximately at elevation −70 extending to elevation −80 to −90 with relatively low blow counts. This suggests that the sands in the zone might be loose, i.e., have a low density. However, these low relative density materials are interfingered with materials having higher relative densities.[204] Only 3 samples from the low blow count zone were cyclically triaxially tested to liquefaction, and two of them were tested at such high relative densities that it is not possible to scale the data to the estimated in situ relative densities. After careful review of the soil conditions at the St. Lucie site, the Staff concluded that investigations additional to those already completed were not required to establish that liquefaction would not occur in the low blow count zone, because it has been the Staff's experience that extensive liquefaction should not be expected to occur in the zone of loose sands because of (1) the high confining pressures that exist at the depth of the layer resulting from the weight of the structures and the weight, due to the high finished grade (el. plus 18) of the compacted backfill; (2) the low intensity VI (MM) of the postulated SSE; and (3) the short time duration of the postulated SSE. The short time duration and low intensity of the postulated SSE are extremely important because the much denser sands above and below the low blow count zone will not have undergone enough significant increase in pore pressure. Therefore no gross foundation failures which could cause a hazard to Category I structures could occur.[205] The Board agrees with the Staff's analysis and finds that blow count sampling was adequate and that the site shows no potential for liquefaction.

67. Contention 2.3(i) raised the question of emergency cooling canal slide blockage potential. The Applicant has not shown that the soils inplace are not subject to liquefaction and slope failure along that portion of the emergency canal barrier and the far end of the switchyard. Therefore, the Staff has required a boring program to determine which zones should be densified, including (1) identification of any extensive zones of soft-sensitive clay that might exist which might cause slope failure or to cause the canal barrier to fail, (2) removal or other stabilization of these zones, (3) confirmation of results of the densification by borings located in appropriate locations, and (4) improvement of the canal barrier foundation. Only those slopes that contain a significant amount of material (high slopes), or are located in restricted areas such as around the emergency canal between Big Mud Creek and the Canal barrier, need to be

[203] Testimony of W. F. Mercurio (2.3(g)) following Tr. 1625, p. 1; PSAR 2.5.4.8, Fig. 2.5-15A.

[204] Bernreuter, p. 6.

[205] Bernreuter, p. 7.

improved because the postulated SSE intensity is too small to induce massive failure of the low slopes of this part of the canal.[206] The Staff has concluded that it is within the state-of-the art of soils engineering practice to engineer an acceptable ultimate heat sink,[207] and the Board agrees. Therefore the Board finds that liquefaction does not cause the site to be unsuitable, and while it is an unresolved safety issue it is not one which constitutes good cause for withholding limited work authorization.

68. In addition, the Board asked the parties to address the question of whether the functioning of the emergency cooling canal would be impaired or lost in the event of earthquake slide blockage occurring simultaneously with an extremely low tide.[208] The Staff concluded that if the Applicant agreed to improve foundation conditions so that the canal barrier and the slopes between the canal barrier and the plant would not fail, then this would remove the Staff's concern about slope failure and possible blockage mechanisms. The Board concludes that there will be no potential for blockage of the emergency cooling canal in the event of an earthquake even with an extremely low tide, provided that the in-situ soils are improved as recommended by the Staff. Accordingly the Board hereby requires that such improvement be made a condition of any permit or license that may be issued pursuant to this Decision.

Contention 3.2

Whether Applicant's emergency plan complies with Appendix E to 10 CFR Part 50 in that neither Applicant nor any state agency has adequately addressed the problem of adequate evacuation of the LPZ.

69. This contention together with Contention 2.2(d) related to whether the road and bridge network was adequate to accommodate evacuation of the population. The Applicant presented testimony by Mr. Kenneth Harris[209] and Mr. John E. Buchanan[210]; the Staff presented testimony by Mr. Richard Van Niel.[211] The Intervenor presented testimony through witnesses called by subpoena as follows: Mr. Wallace Johnson, Mr. Brian Tredray, Mr. Philip Thibedeau, Sheriff C. L. Norvell, Sheriff James D. Holt, and Capt. W. B. Oliver.[212]

[206] Bernreuter testimony following Tr. 1666, pp. 8, 9.

[207] Id.

[208] Board Question IIID., See Appendix B.

[209] Testimony of Kenneth Harris following Tr. 1310.

[210] Testimony of John E. Buchanan following Tr. 1310.

[211] Testimony of Richard Van Niel following Tr. 1310.

[212] Tr. 1414; Tr. 1517; Tr. 1540; Tr. 1568; Tr. 1592; Tr. 1602.

70. The Applicant introduced testimony which evaluated the feasibility of evacuation of the LPZ using A1A and found that 12 hours would be available for evacuation and that the entire LPZ population projected for the year 2000 could be removed in less than 5 hours.[213] The Regulatory Staff also evaluated the ability of highway A1A to accommodate evacuation of the LPZ and found it sufficient for evacuation and access of emergency equipment.[214] In addition the Staff analyzed the situation which would exist if the highway were cut by a major storm. The Staff found that a storm capable of breaking the highway would prompt protective measures, which may include evacuation prior to the storm's arrival. They determined that even if the highway were breached at the site, evacuation could proceed in one direction so that evacuation and safety efforts would not be impaired.[215] It was also noted that a storm of that magnitude would provide more favorable dispersion in the event of a radioactive release, thus making the necessity for evacuation less pronounced.

71. Applicant's Witness Harris[216] and Staff's Witness Van Niel[217] agreed that the question of whether a bottleneck of traffic would occur as people evacuated the island is not of significant concern, because the bridges are well outside the LPZ. In addition the Staff offered the opinion that appropriate traffic control would provide the necessary protective action objectives.[218] The South Florida Area Coordinator for the Division of Disaster Preparedness for the State of Florida testified that the feasibility of evacuation has been evaluated by those state and local agencies charged with that responsibility. There is no question but that an evacuation is feasible and can be carried out within the projected time frame for such actions.[219]

72. The Intervenor produced testimony by Wallace Johnson, Public Health Physicist, Department of Health and Rehabilitative Services, State of Florida, who noted that his department has promulgated a Radiological Response Plan, which has been reviewed by various agencies, including the AEC Regulatory Staff.[220] In Mr. Johnson's professional opinion, the appropriate state agencies have in fact adequately addressed the problem of evacuation of the LPZ as well as other areas,[221] and in the official position of the Division of Health, there is in fact a reasonable probability that appropriate protective measures could be

[213] See note 209, p. 7.
[214] See note 211, p. 4.
[215] Id.
[216] Harris following Tr. 1310, p. 8.
[217] Van Niel following Tr. 1500, p. 5.
[218] Id.
[219] Buchanan following Tr. 1310, p. 5.
[220] Intervenor's Exhibit 3 at p. 4.
[221] Id., p. 10.

taken in behalf of occupants within the five mile radius or at greater distance if required.[222]

73. Intervenors Witness Mr. Brian Tredray, Martin County Civil Defense Coordinator, familiar with and presently involved in the preparation of the evacuation plans, testified that evacuation for a hypothetical 37,500 persons, all located south of the plant in the LPZ, could be accomplished in 3.5 to 7 hours.[223] Philip Thibedeau, Civil Defense Director for St. Lucie County, also called by Intervenors, testified that he was involved in preparation of the evacuation plan, that the plan was adequate, and that evacuation could and would be accomplished.[224] C. L. Norvell, Sheriff of St. Lucie County, called by Intervenors, testified that he would respond, that in his opinion evacuation of the LPZ would be presently feasible, and that evacuation of future increased population in the LPZ would also be possible due to increased manpower, vehicles, and road facilities.[225] James D. Holt, Sheriff of Martin County, called by Intervenors, stated that his department would be able to assist and accomplish evacuation of this area,[226] and Captain W. B. Oliver, Troop Commander, Troop L, Florida Highway Patrol, also called by Intervenors, testified to the same effect.[227]

74. In addition, in response to Board questions, the Staff testified that projected population increases would not prevent effective evacuation of the LPZ among current road conditions[228] and that such Staff conclusions would not be changed if one assumes and doubles Intervenor's Witness Schmidt's population figures.[229] There is no evidence in the record to persuade the Board to the contrary. Accordingly in view of the findings herein the Board concludes that contentions 3.2 and 2.2(d) are without merit.

B. Site Suitability

75. Pursuant to the Commission's rules relating to "Preconstruction permit activities" published on April 24, 1974,[230] the parties presented testimony on site suitability considerations identified in 10 CFR Part 100 of the Commission's regulations relating to health and safety issues. The criteria for site suitability are population density; land use characteristics; acceptability as regards possible

[222] Tr. 1438.
[223] Tr. 1538.
[224] Tr. 1541-1556.
[225] Tr. 1575-1583.
[226] Tr. 1592-1599.
[227] Tr. 1607-1609.
[228] Tr. 1512-1513.
[229] Tr. 1514.
[230] 39 *Fed. Reg.* 14508.

conflict with existing military, industrial, or transport facilities; and physical characteristics.

76. The proposed facility is located on the landward side of highway A1A which passes directly through the site, approximately 1000 ft. east of the reactor containment building The site is a 1132-acre tract located on Hutchinson Island in St. Lucie County about 8 miles south of Ft. Pierce, Florida and 8 miles north of Stuart, Florida. St. Lucie Plant Unit No. 1 is now being constructed on the site under Construction Permit No. CPPR-74 issued by the AEC on July 1, 1970. The site evaluation was made for construction of a PWR reactor having a thermal power rating of 2560 megawatts thermal (851 megawatts, electrical).[231] Of the 1132 acres, approximately 300 acres will be used for both plant No. 1 and proposed plant No. 2.[232] The site is generally flat, covered by vegetation characteristic of Florida Coastal mangrove swamps. At the ocean side, the land rises slightly in a dune which is generally continuous and ranges in elevation from 8-14 ft. mlw.[233] A description of the site is adequately given in the FES.[234]

77. Applicant has raised the highway A1A grade level to about elevation +18.3 ft. mlw. in front of the plant and has constructed bridges across the plant intake and discharge canals for the highway.[235] The foundation soils for safety related structures consist of compacted fill raised to a grade level of +18.0 ft. mlw.[236] Foundations for all seismic Category I structures and the turbine building within the plant island will be Class I fill. All other nonseismic structures will be supported by Class II fill.[237]

78. Population density and land use characteristics were considered at length in paragraphs 60-63 in connection with the resolution of the matters in controversy, but are also valid for general site suitability considerations. In addition, the Board notes that the Staff analyzed the Applicant's data presented in the PSAR and used data from published reports of population projections by the U. S. Department of Commerce, the 1970 census, Oak Ridge National Laboratory, a site visit, the U. S. Geological Survey, a visit to local officials, the AEC publication "Population Distribution Around Nuclear Plant Sites" of April 17, 1973, and telephone conversations with local officials, to prepare its presentation in Section 2.2 of the FES.[238] As stated above, the demographic information presented in the Applicant's ER and PSAR and the Staff's FES was

[231] SER following Tr. 3344 at p. 1-1.
[232] FES p. 3-7.
[233] SER p. 2-21.
[234] FES, Section 2.
[235] SER p. 2-21.
[236] Id.
[237] Applicant's Exhibit 2A, p. 2.5-39.
[238] Testimony of Dr. Emile A. Bernard following Tr. 904.

found to be inaccurate and was further amended and updated during the hearing by the testimony of the witnesses for the Applicant[239] and the Staff.[240]

79. In July 1974, prior to the evidentiary hearing, the Intervenor counsel called the Staff's attention to discrepancies in population data given in the FES. Staff then made a reevaluation of the population data.[241] The Staff became aware of inaccuracies in Figures 2.5 and 2.6 in the FES during the course of the hearing.[242] Apparently these inaccurate figures were not relied on by the Staff in its calculations; however, the Staff submitted additional testimony which corrected the FES.[243] Figures 2.5 and 2.6 are used to graphically display the population data from the FES in sectors corresponding to compass points in annular rings surrounding the plant site and have not been corrected to reflect the most recent data developed by the Staff.[244] Applicant has likewise presented additional information, in the form of a proposed amendment to the ER which corrected Figure 2.2-1 thereof, with the most recent data developed by Applicant.[245]

80. During examination by the Intervenor's counsel, and after further Board questioning, it became clear to the Board that the initial incorrect population data presented in the FES was not the result of any intentional effort to mislead or of negligent conduct on the part of the Staff. It apparently resulted from an apparent oversight by Staff in compiling Applicant's data. These data were corrected by the testimony of Dr. Bernard. The Board was persuaded that the errors in Figs. 2.5 and 2.6 of the FES were inadvertent errors that arose during the final editing stage of the FES. The Staff readily admitted the error, took immediate steps to correct it during the proceedings, and responded to cross-examination and Board questioning in a forthright, candid manner. Accordingly the Board hereby modifies the FES by inserting therein corrected Figures 2.5 and 2.6[246] in substitution for those initially presented. In view thereof and further in view of the findings in paragraphs 60-63, 78, and 79,

[239] Testimony of Philip W. Moore relating to Contention 2.2(a) follows Tr. 764, hereafter "Moore 2.2(a)". Testimony of Philip W. Moore relating to Board Question concerning Contention 2.2 follows Tr. 2967, hereafter "Moore 2.2."
[240] Supplemental Testimony of AEC Regulatory Staff on changes to FES related to population by Francis A. St. Mary follows Tr. 2353; Supplemental testimony of AEC Regulatory Staff on Board questions related to demography by Dr. Emile A. Bernard, pp. 1-37.
[241] Tr. 1466.
[242] Tr. 1457.
[243] Tr. 1445, 2744; Supplemental testimony of AEC Regulatory Staff on changes to FES related to population by Francis St. Mary, follows Tr. 2353.
[244] Testimony of Dr. Bernard following Tr. 2722, p. 2.
[245] Testimony of P. W. Moore following Tr. 2967.
[246] As contained in testimony of Witness St. Mary, see note 243, *supra*.

above, the Board finds the site suitable as to the population density and land use requirements of 10 CFR Part 100.

81. As to site suitability criteria relating to nearby transportation, industrial, and military activities, the Board finds that the St. Lucie County airport, located 12 miles from the plant site;[247] the Stuart Airport, approximately 11 miles from the site; and two smaller private airports, near Ft. Pierce and approximately 10 miles from the site, do not service commercial airlines.[248] The Florida East Coast Railway and State Route 707 run along the west bank of the Indian River approximately 2 miles from the reactor building. The Indian River is used as part of the intracoastal waterway. There are no military bases or firing ranges, missile sites, manufacturing plants, chemical plants, or oil and gas lines or tank farms within 5 miles of the site.[249] After review, the Staff concluded that there are no nearby industrial, transportation, or military facilities or activities which preclude acceptability of the site. Based on the record, the Board agrees and finds the site suitable as to the transportation, industrial, and military activity criteria of 10 CFR 100.

82. The physical characteristics of the site were considered in terms of meteorology, geology and seismology, emergency plans, and hydrology. With respect to meteorology, the Board notes that all meteorological contentions were disposed of by summary disposition, except contention 2.1(b) treated in paragraphs 52-59 above. In addition to considering the specific matter in controversy, the Board must also determine whether there are any meteorological characteristics in general which would preclude site suitability.

83. The Applicant initiated an onsite meteorological measurements program in December 1970 and gathered data from this program for the time period March 1971 – February 1972. The Staff used these data to independently calculate relative concentration factors using the diffusion model described in Regulatory Guide 1.4.[250] These relative concentration factors were then used, along with appropriate release magnitudes, to calculate offsite accident doses for comparison with the guideline values of 10 CFR 100.11. The calculations demonstrated that additional Engineered Safety Features (ESF) would be required to reduce calculated offsite doses to values below the guideline values of 10 CFR Part 100 at a distance of one mile.[251] The Applicant is committed to providing sufficient additional ESF's to reduce calculated accident doses at a distance of one mile to less than the guideline value specified by §100.11 for a Low Population Zone (LPZ) distance.[252] Independent calculations by the Staff

[247] SER p. 2-13.

[248] Id.

[249] Id.

[250] SER pp. 2-14 to 2 20.

[251] Testimony of Calvin W. Moon following Tr. 3340, pp. 3-5.

[252] Testimony of Frederick G. Hugger following Tr. 1310.

showed that reduction of containment leak rate from 0.5 to 0.1 percent of containment volume per day while maintaining the same fraction of unfiltered release would enable the Applicant to achieve the required dose reduction.

84. Following such calculation, the Staff concluded (a) that it is feasible for the Applicant to modify the facility design to achieve required dose reductions using any of several combinations of ESF's and/or containment test leak rate reductions;[253] (b) that the onsite joint frequency meteorological data for the period March 1971 - February 1972 provided an acceptable basis to make conservative and representative estimates of atmospheric dispersion characteristics for accidental and routine gaseous releases from the plant;[254] (c) that to permit verification of the relative concentration values, the Applicant must submit an additional one year period of data, with acceptable data recovery, from a continuation of the meteorological measurement program; and (d) that the Staff will require the onsite program to be upgraded to conform to the recommendations of Regulatory Guide 1.23. The Board agrees with these conclusions, finds the proposed procedure appropriate, and concludes that, based on Applicant's monitoring program and the Staff's review of procedures and collected data and the findings of the Board in paragraph 59 above, there are no meteorological conditions which would make the site unacceptable.

85. The site suitability characteristics relating to geology and seismology have been considered in some detail relative to Contention 2.3 above. In addition, the Applicant and Staff provided testimony generally as to the geological and seismological characteristics of the site. The Applicant performed various geologic investigations, including a detailed summary of published and unpublished literature with geologic and structural maps and well log data, contact with geologists familiar with the structures of the St. Lucie County area, a study of various aerial and satellite photographs, and various types of field work including borings and continuous seismic reflection profiling.[255] The Staff reviewed the efforts, activities, and results of the Applicant's testing programs.[256] In addition, the Staff reviewed and evaluated information from the U.S. Geological Survey and the U.S. Coastal and Geodetic Survey[257] and contacted those individuals who had postulated that faulting may exist in the site area.[258] As to seismology, the Applicant undertook an adequate

[253] Several other ESF's, such as chemical additives in the containment spray and additional filtering of containment leakage, have been used in other facility designs to achieve reduction in offsite doses.

[254] SER 2.3.6.

[255] Testimony of George F. Sowers following Tr. 1625.

[256] SER 2.5.1; Testimony of Thomas Cardone at Tr. 1674-1678.

[257] Id.

[258] Tr. 1678.

investigation to review the earthquake history of the site,[259] including blow count data and liquefaction potential.[260] The Staff reviewed Applicant's results,[261] historical earthquakes, and the structure and soil conditions of the site and concluded that the earthquake history is adequately chronicled, that an intensity of VI MM is conservative, acceptable, and feasible for the seismic design of the facility, and that, while it was not possible to establish adequately that liquefaction could not occur in the low blow count zone from the test data alone, nevertheless, from past experience involving a number of critical factors,[262] the Staff concluded that the site shows no potential for liquefaction. In addition, structural engineering analysis performed by Applicant[263] and reviewed by Staff[264] indicates that dynamic interaction between proposed Unit No. 2 with Unit No. 1 being constructed will be no more than 5%.

86. Based on the evidence of record, the Board agrees with the findings of the Staff as to the said physical characteristics relating to geology and seismology and concludes that the earthquake history is adequately documented, that the seismic design of intensity VI MM is adequate and reasonable, that the site does not show potential for liquefaction, and that the interaction between St. Lucie No. 1 and the proposed St. Lucie No. 2 will not be more than 5%. Subject to the improvement of foundation conditions as required by the Board in paragraph 68 above, the Board further concludes that there will be no potential for blockage of the emergency cooling canal in the event of an earthquake, even with extremely low tide. Thus, the Board concludes that the site meets the requirements of 10 CFR 100.10 and Section 1(r) of Appendix A to 10 CFR Part 100.

87. As to emergency plans, the findings of the Board, above, in connection with Contentions 2.2 and 3.2 are dispositive of issues related thereto. In addition, the Board notes the description by the Applicant of his preliminary plans for the possible evacuation of the low population zone as contained in Section 13.3 of the PSAR. The Applicant has also entered into preliminary arrangements with the State of Florida, and the other officials of local, state, and Federal offices for assistance in case of need for evacuation. The Staff has concluded that the Applicant's plans for assigning duties and establishing procedures to assure that the necessary resources are available and that the necessary actions are taken to protect health and minimize danger to personnel, limit damage, and establish control in the event of an emergency situation are

[259] Testimony of George Sowers following Tr. 1625, pp. 7-9.
[260] PSAR 2.5.4.8. Testimony of W. J. Mercurio (2.3(g)) following Tr. 1625, p. 1-3.
[261] Testimony of Bernreuter following Tr. 1669, pp. 2-7.
[262] See Bernreuter, pp. 5-7.
[263] Testimony of W. J. Mercurio (2.3(h)) following Tr. 1265, pp. 1-3.
[264] Testimony of Robert Shewmaker following Tr. 1669, pp. 1-4.

adequate.[265] In view of the entire evidence of record, the Board agrees and concludes that the plans, statements, and commitments of the Applicant meet the intent and requirements of 10 CFR Part 100 and 10 CFR Part 50 Appendix E on evacuation planning at the construction permit stage.

88. The hydrological characteristics of the site were reviewed and considered in some detail in connection with Contention 2.1(b). In addition, the Board notes that potential plant site flooding may occur from intense rainfall or overocean windstorms which induce surges. Applicant has provided acceptable criteria for site drainage facilities to drain runoff away from safety-related facilities during intense rainfall as severe as a local probable maximum storm and criteria to be implemented during the construction of Unit 2 which will preclude flooding of Unit 1 from locally intense precipitation up to and including the severity of the local Probable Maximum Precipitation.[266] Intake cooling water pumps are located on the plant intake structure on the landward side of the plant and flood protected to 22 ft. above mean low water (mlw.).[267] These pumps will be located outdoors and are designed to operate in 100% relative humidity salt laden atmosphere during torrential rains and hurricanes.[268]

89. The flooding potential from severe hurricanes has been evaluated independently both by the Applicant and by the Staff, using a hypothetical probable maximum hurricane (PMH).[269] The Staff calculated PMH storm parameters and used them in conjunction with a recognized and commonly used hurricane surge model developed by the Coastal Engineering Research Center, Corps of Engineers.[270] The Staff thus calculated a surge level to be 16.7 ft. above mlw.;[271] the Applicant calculated a surge of 16.2 ft. mlw.,[272] and the Intervenor calculated 15 MSL (translating to 16.3 ft. mlw.).[273] For conservatism, the Board adopted the Staff's calculation of 16.7 ft. In view of the Staff calculation of +22 ft. mlw. for wave run-up, Applicant has agreed to protect entrances of safety-related structures with stoplog closures to be erected above the grade level of +18 ft. mlw. to an elevation of +22 ft. mlw.[274] Applicant further agreed to provide for sandbagging and plastic sheeting to minimize inleakage up to 22 ft. mlw., the maximum level of wave run-up, if the

[265] SER Section 13.3.
[266] Id., p. 2-27.
[267] Testimony of Hulman, p. 11, following Tr. 1686.
[268] SER pp. 9-6, 7.
[269] A PMH is a hypothetical hurricane having the combination of characteristics making it the most severe that can probably occur at the proposed site.
[270] Hulman, pp. 5-7.
[271] Hulman, p. 8.
[272] Yeh, p. 2.
[273] Sugg, p. 1.
[274] PSAR, amendment No. 13, p. Q2.10(R)-2.

Staff would require it,[275] and the Staff subsequently required these measures.[276] Applicant also agreed to comply with a Staff request for the construction of monolithic concrete paving approximately 200 ft. long, 8" thick, from the top of the slope (+18' mlw.) to plus 5' mlw. to help prevent erosion of the plant yard.[277]

90. As one of the hydrological factors affecting the suitability of site, the Board considered the effect of a serious storm on the cooling system of the plant: The ocean intake structures are designed to withstand the largest wave that can be supported in the depth of water in which they are located.[278] The ocean intake lines are buried at least 12 ft. below the ocean bottom in the surf zone and 5 ft. below the bottom elsewhere, and this intake system is designed to supply water from levels as low as about - 16' mlw., which is well below the lowest ocean level reasonably possible at the site resulting from a PMH moving offshore along a critical track coincident with astronomical low tide conditions.[279] The Board finds that the safety function of the intake system will not be threatened by the PMH. In addition, the Board finds that the emergency canal is designed to remain functional, even if filled in as a result of seismically induced liquefaction, which filling in exceeds that which can be expected during a PMH.[280] Thus, the Board concludes that the emergency cooling canal will remain functional during PMH conditions.

91. The primary ultimate heat sink system for the proposed plant consists of a widened and deepened area at the end of the intake canal, along with the ocean intake structure. The intake cooling water pumps for this system are located in the plant intake structure, flood protected to a level of 22 ft. mlw. above the level of any PMH flooding. Big Mud Creek is the alternative source of water. Flow from this backup source is normally blocked by a bulkhead structure across a connecting channel from Big Mud Creek.[281] The bulkhead structure is designed to include plugged holes which can be opened by remote actuation to allow water to flow from Big Mud Creek when the water level at the plant intake falls below that in Big Mud Creek.[282] Low water conditions in Indian River were evaluated independently by the Applicant and Staff to the satisfaction of the Board.[283] The Board finds that the water supply from either the ocean intake or the canal from Big Mud Creek is sufficient to permit the safe

[275] Id.
[276] SER p. 2-25.
[277] PSAR Amendment No. 13, p. Q2.10(d)-4.
[278] Testimony of John Fotheringham following Tr. 1839.
[279] Hulman, p. 15.
[280] Fotheringham, p. 2.
[281] SER pp. 2-28 to 2-29; 9-8, 9-9.
[282] Id.
[283] Hulman, pp. 15, 17; SER p. 2-29.

shutdown of St. Lucie Unit 2 and its maintenance in a safe shutdown condition, and therefore the ultimate heat sink is acceptable from a hydrologic engineering standpoint. Accordingly, and in view of paragraphs 88-90 above, the Board finds that there are no hydrological factors that would preclude this site from being a suitable location for nuclear power reactors of the general size and type proposed for St. Lucie 2 plant under the criteria set forth in 10 CFR Part 100.

92. Considering all the site suitability characteristics discussed in paragraphs 75-91 above, the Board concludes that the site is suitable for a nuclear power reactor of the size and type proposed by the Applicant.

C. Compliance with NEPA, Section 102(C) and (D), and Appendix D of 10 CFR Part 50

93. In accordance with Appendix D to Part 50 of the Commission's Regulations, Applicant submitted its Environmental Report (ER) dated May 14, 1972, and subsequent Amendments 1-5.[284] Following docketing of the Applicant and ER on September 4, 1973, a Notice of Receipt for Construction Permits and Facility Licenses and Applicant's Environmental Report was duly published.[285]

94. Based upon information submitted by Applicant in the ER and upon its own independent review and analysis, the Staff prepared a Draft Environmental Statement (DES) which was issued on February 5, 1974. A Notice of Availability of the DES was issued on February 5, 1974,[286] and copies of the DES, with requests for comment, were sent to appropriate federal, state, and local agencies. The notice provided that interested persons may, on or before April 1, 1974, submit comments on the ER and the DES for consideration by the Commission. The notice further provided that Federal and state agencies were being provided with copies of the ER and DES, and that, when any comments from these agencies were received, they would be made available for public inspection.

95. After receipt and consideration of comments on the DES, the Staff prepared and issued a Final Environmental Statement (FES)[287] which discusses the environmental impact of the construction and operation of the facility. It also presents (a) a detailed description of the site and the facility, with a discussion of the impact of the site preparation, and a consideration of transmission line construction; (b) the environmental effects of plant operation, with a discussion of the environmental monitoring program, and an assessment

[284] Applicant's Exhibits 4A, B.
[285] 38 *Fed. Reg.* 26483, September 21, 1973.
[286] 39 *Fed. Reg.* 4938, February 8, 1974.
[287] Staff's Exhibit S-1.

of the environmental effects of accidents; (c) a detailed evaluation of the proposed action, including consideration of the need for power; (d) comments on the adverse environmental effects which cannot be avoided, including the relationship between local short-term uses of man's environment and maintenance and enhancement of long-term productivity; (e) the irreversible and irretrievable commitments of resources; (f) a review of alternative energy sources, sites, and plant design alternatives; (g) a cost-benefit analysis; and (h) a discussion of the comments received on the DES. The FES concludes, after weighing the environmental, economic, technical, and other benefits of the facility against environmental and other costs, and considering available alternatives, that the issuance of a construction permit for St. Lucie Unit No. 2, made subject to certain conditions for the protection of the environment, would comply with the provisions of NEPA and Appendix D to 10 CFR Part 50. Based on the evidence of record, and subject to the conditions set forth herein, the Board agrees.

Impacts of Construction

96. The primary impact on the site occurred with the construction of Unit No. 1. This impact involved about 300 acres and resulted from approximately 2 million yards of fill being placed on a previously damaged mangrove swamp. This fill covered approximately 200 acres. In addition, excavation of the intake and discharge canals between ocean and reactor changed an additional 100 acres to waterways.[288] The area of fill on which Unit No. 2 is to be located will be excavated for foundations, associated dewatering of the excavations will be carried out, and the area involved will be approximately five acres. Water extracted in this process will be directed to the intake or discharge canals. The Applicant assures that such discharges will meet applicable State of Florida regulations for turbidity but that, if turbidity is a problem, this water will be directed to a settling basin prior to discharge.[289]

97. While all construction for the intake lines will be completed during construction of Unit 1, installation of the discharge line for Unit 2 will involve a recutting of the beach and dune and will destroy the native dune stabilizing plants which the Applicant was required to establish following installation of the line for Unit 1. Thus, excavation of the dune provides an unusual opportunity for wave action from a severe storm to cut through the island until dune stabilizing plants have been fully reestablished. While the Applicant plans a temporary dune to provide partial protection to the island during the time the dune is excavated, nevertheless normal protection will only be attained when

[288] FES Section 4.1.
[289] Id.; ER p. 4.1-2.

native plants reach maturity with their network of roots acting as a deterrent to cutting. The Board agrees and adopts the Staff's recommendation set forth at p. "v" of the FES to replant the dune as soon as possible after excavation with dune stabilizing plants indigenous[290] to the area, and hereby makes it a condition to any authorization for construction issued pursuant to this decision.

98. The Applicant has committed itself to permitting unrestricted public access for recreational purposes consistent with health and safety and plant protection conditions. Such use should not be significantly affected beyond that brought about by the conduct and operation of Unit No. 1, except that the ocean beach in the vicinity of the discharge may be limited during the time of discharge line installation.[291] Construction and placement of the ocean discharge line will temporarily impede nearshore boat traffic. However, significant impact on recreational water use is not anticipated. General construction activities in the ocean will create small scale turbidity currents as well as temporarily interrupt the natural littoral processes.[292] Restrictions requiring turbidity not to exceed fifty (50) Jackson units will be imposed by the Florida State Water Quality Standards.[293] The Board agrees as to the Staff's conclusion that no significant impact on water use is envisaged.[294] In addition, since there will be no additional transmission rights-of-way required for Unit No. 2, beyond that required for Unit No. 1 there will be no additional effect on agriculture or water producing savanna lands in the surrounding areas.[295]

99. The possible disruption of turtle nesting at the site is an important factor considered by the parties and the Board. Additional construction activities on the beach and dune will cause another period of disruption to turtle nesting in the area.[296] To assist in minimizing such disruption, the Applicant has committed itself to a daily nest identification and relocation program in the affected area during the turtle nesting season.[297] Moreover, plant lighting could cause misorientation of turtle hatchings with resulting increased mortalities. Therefore, during Unit No. 1 construction, the Applicant was required to plant Australian pine or other suitable plants as necessary behind the dune to provide a light shield for the beach and dune area. If this light screen is disturbed for Unit No. 2 construction, the Applicant has committed to replant pines as soon as possible.[298] This would be in addition to the planting of dune stabilizing

[290] FES Section 4.1.
[291] FES Section 4.2.
[292] Id.
[293] Id.
[294] Id.
[295] FES 4.1.
[296] FES 4.3.1.
[297] ER p. 4.1-4.
[298] ER p. 4.1-1.

plants.[299] Also, in an effort to minimize the amount of predation on turtle nests, the Applicant has committed to a program to control all edible refuse during plant construction and operation to limit the raccoon population, to include procedures to prevent deliberate feeding of raccoons in the area by construction and operating personnel.[300]

100. Approximately three-fourths (about 830 acres) of the site will remain essentially in its preconstruction state. As the remainder of the island becomes developed for human use, this substantial acreage may serve as a sanctuary for species which would otherwise be evicted from the island.[301] Increased commercial development of the island appears inevitable and will probably have a more serious effect on the terrestrial biota than the construction activity. The Board believes the potential of the site as a wildlife sanctuary to be favorable and requires the Applicant to recommend further actions towards this end, as well as to carry out its commitments. Effects on aquatic organisms will occur from construction of a second discharge line with a multiport diffuser planned for Unit No. 2 which will extend into the ocean beyond the discharge for Unit No. 1. Construction of this discharge line will involve dredging a channel 20-ft. deep about 2800 ft. into the ocean. Some 17,600 m^2 (4.3 acres) of bottom area will be dredged and 82,000 m^3 (107,000 yd^3) of material will be removed. Protection by sheet piling and onshore disposal of spoil should reduce the effect of siltation on aquatic ecosystems to an insignificant level.[302] Organisms dredged up will be lost. The Applicant calculates that these will number some 16 million polycheates, bivalves, echinoderms, amphipods, and decapods.[303] This number appears to be a very small portion of the total population of these organisms in the area, and repopulation of benthic communities so disturbed is expected within about a year's time. No species of commercial importance are included in the benthic fauna in the area to be dredged, and the Staff expects no significant long term or population effect on the aquatic ecosystems to result from dredging activities associated with the construction of the discharge line.[304] Based on the evidence of record, the Board agrees.

101. For several years the condenser cooling system will be in use with only Unit No. 1 operating. This means the approach velocity at the intake structures will only be about 0.5 fps, which is below that normally desirable to provide a warning signal to fishes to avoid the area, thus increased entrapment in the intake canal may result. The Staff has suggested that the extent of actual fish

[299] FES 4.3.1.
[300] FES 4.3.1; 4.5.1(7).
[301] FES 4.3.1.
[302] FES 4.3.2.
[303] ER 4.1-6.
[304] FES 4.3.2.

entrapment in the canal be carefully monitored, and that, if it becomes a problem, action be taken to increase the intake velocity to about 1 fps.[305] The Board agrees and adopts this recommendation as set forth at FES 4.5.2(2) as a condition to any authorization for construction issued pursuant to this Initial Decision.

102. Insufficient entrainment and dilution by the ambient water due to low exit velocity may occur if only Unit No. 1 is operating, because only half the normal flow of heated water will be going out both discharge lines. Thus maximum surface temperatures of 7.4°F and 2°F above ambient are predicted under these conditions for the Unit No. 1 and Unit No. 2 discharge points, respectively.[306] The Staff recommends use of the Unit No. 2 multiport discharge line as soon as it becomes available. The Staff further recommends that when only one unit is operating, then the multiport discharge line be utilized.[307] The Board agrees and adopts this recommendation as set forth in FES 4.5.2 and page "v"(7)(c) as a condition to any authorization for construction issued pursuant to this Initial Decision.

103. Dewatering of the construction site will be effected in conformance with State of Florida Water Quality Standards.[308] Also, chemicals used during construction and startup will be neutralized to meet state water quality standards. Accordingly the Board concludes that there will be no significant effect from discharge of waters or chemicals meeting the state standards. In addition, noise and dust, and release of combustion products to the atmosphere, from construction equipment are not expected to have any appreciable impact on the residents of the area who live over 1.5 miles away from the site.[309]

Impact of Operation

104. Most of the operating impacts on land use will have occurred with the installation and operation of Unit 1, and Unit 2 is expected to have little additional impact.[310] The major aesthetic impact also occurred with the installation of Unit 1. The three transmission lines across Indian River are the most readily visible feature of the plant, but these have already been considered and evaluated in connection with Unit No. 1. No additional lines will be necessary for Unit No. 2. The reactor and turbine buildings can be seen by residents of the area, and, with proposed Unit No. 2 being added, this visual impact will be increased. This factor was considered by the Board in its

[305] Id.
[306] FES 3.4.2; 4.3.2.
[307] FES 4.3.2; 4.5.2(3).
[308] ER 4.1-2.
[309] FES 4.4.
[310] FES 5.1.

evaluation. The Board also concludes that the overall effect on the terrestrial biota of adding Unit No. 2 to the site will be insignificant.[311]

105. There is no direct use of groundwaters at the site because no fresh groundwater has been found on Hutchinson Island. Subsurface waters will receive inflows from plant waste waters discharged to the sanitary treatment system and the settling basins. In view of the relatively small labor force to be used for operation, the Board sees little significant contamination of groundwaters from these sources. However, the Applicant has committed itself to connect with the municipal sewage treatment facilities as soon as the sewer line is brought within approximately 5 miles of the plant.

106. The plant will utilize water from Big Mud Creek for the emergency cooling system. The Board agrees that no significant impact on the water use of Big Mud Creek is envisioned, provided that the total volume of water drawn does not exceed 4 million gallons per year,[312] and hereby makes this a condition to any authorization for construction issued pursuant to this Initial Decision.

107. Chlorine gas will be utilized for biological defouling of the condenser cooling system at a rate which will provide a concentration of 5 ppm entering the condenser for 15 min. each day. The biocide will be controlled so the chlorine content of the circulating water leaving the condenser will contain a maximum free residual of 1.5 ppm. This will be diluted by a factor of 8 in the discharge canal when the circulating pumps for both Units No. 1 and No. 2 are operating. An operating license condition established for Unit No. 1 provides that concentrations of total residual chlorine be monitored at the ocean discharge to verify the removal of chlorine in the discharge. The Staff has also suggested that chlorine residuals, such as monochloramine and trichloramine should be measured to ensure a complete description of the total chlorine residual.[313] The Board adopts the recommendations for monitoring of chlorine and chlorine residuals provided for Unit No. 1 and makes them a requirement for Unit No. 2. Other chemical releases will not have a measurable impact on the use of adjacent waters nor on the biota therein.[314] Subject to the conditions above, the Board finds that chemical discharges from Unit No. 2 will not result in a significant adverse impact.

108. The actual thermal plumes in the vicinity of the Unit No. 2 discharge will be highly variable as a result of wave action, reversing longshore currents and the plume interaction from the two discharge lines. Heated water from the discharges can be carried by currents to the intake and thus recirculated to the

[311] FES 5.5.1.
[312] FES 5.2.2.
[313] FES 5.2.3.
[314] Id.

plant.[315] There is also a possibility of thermal buildups because of the orientation of Unit No. 1 discharge and its proximity to the Unit No. 2 discharge system. A buildup from the Unit No. 1 plume could increase the background ocean temperature in the vicinity of the Unit No. 2 discharge and effectively reduce the effectiveness of the diffuser system. Thus some question exists regarding whether or not the combined plume from both units will meet the NPDES surface temperature rise limits of 1.5°F.[316] Because of these uncertainties in the FES and taking note of comments made by the Environmental Protection Agency and the Department of Commerce[317] that recirculation and the increased size of the thermal plume could have indirect effects upon the biota, the Board submitted written questions with respect to thermal discharges.[318] Testimony of Witness Shashidhara emphasized the conservatism of the modeling process he had used in calculation of the near field effects.[319] However, from his testimony it was not clear to the Board whether or not his modeling processes had taken into consideration circumstances under which tidal fluctuation would provide dilution but also would spread the plume over a wide area allowing interaction between the discharge and intake units.[320] The Applicant and Staff relied chiefly upon a mathematical analysis presented in the FES for Unit No. 1[321] which was checked against available physical-hydraulic models. This, however, may not be entirely appropriate for conditions at the discharge site.[322] Although the Applicant has sponsored a comprehensive physical-hydraulic model study at the University of Iowa,[323] results from such a model were not available at the evidentiary hearing.[324]

109. Staff Witness Baca's testimony also stressed the belief that there was conservatism in the Applicant's model of circulation. The basis for this belief was past experience in other situations in which these techniques were used in predicting isotherm distribution.[325] However, Witness Baca acknowledged that there would be values to be derived from conducting postoperational monitoring of the Unit No. 1 plume to determine if the predictions of plume size are correct, to see if the plume meets federal and state standards, and in general to verify the assessment made of thermal conditions. Witness Baca recommended

[315] FES 5.2.3, p. 5-3.
[316] FES 5.2.3.1, p. 5-4.
[317] FES 11.4.1 and 11.4.2.
[318] Appendix B.
[319] Testimony of Nagalapur Shashidhara following Tr. 1768.
[320] Tr. 2944, 2941; FES 11.4.1, p. 11-12.
[321] FES 11.4.1.
[322] Id.
[323] Id.
[324] Tr. 2945.
[325] Tr. 2945.

such monitoring to the Board.[326] During cross-examination, Witness Baca recommended infrared mapping of the thermal field from an aircraft scanning device.[327] The Board hereby requires, as a condition to any license issuing from this Decision, that monitoring of the thermal field as recommended by Witness Baca[328] be undertaken after Unit No. 1 is operational. Such monitoring will be undertaken at such times and under such conditions of tide, meteorology, and current that maximum recirculation and maximum buildup of heated effluent would be predicted from interactions between the two discharge plumes and between the two discharge plumes and the intake.

110. The Board also recognizes that the combined plume of Unit No. 1 and Unit No. 2 may have a significant effect on sea turtles coming into the plume; however, facts gathered to date do not show this. Special studies on thermal effects on sea turtles were required as a condition to Unit No. 1. Applicant conducted surveys during nesting seasons of 1971 and 1973.[329] After review, the Staff concluded that the probable impact of plant operation on sea turtles would be acceptable.[330] The Board agrees but hereby requires as a condition to any license issued pursuant to this Initial Decision that turtle nest surveys continue to be conducted to determine changes in nesting patterns which might be indicative of plant related effects and that the results of such surveys be delivered to the Staff and published promptly.

111. Some fish and planktonic organisms will be entrained in the ocean intake system. Fish will be trapped in the intake canal with no mechanism for return to the ocean. Most planktonic organisms will eventually be killed by thermal shock as they pass through the condenser. However, the numbers will be small and the impact on the ecosystem is expected to be minor.[331] Impingement losses are expected to be of minor significance because (1) the velocity caps at the ocean intake are expected to minimize the numbers of fishes entering the intake system, and (2) very few large invertebrates such as crabs have been reported in the offshore waters near the intake and, because the intake is raised above the bottom, few of these are expected to enter the canal system.[332] Fish eggs and larvae will be subject to passage through the plant condenser system. While these have not been identified, the waters off Hutchinson Island are not thought to be important spawning or nursery areas for species of commercial importance. The Staff has concluded that entrained eggs

[326] Tr. 2948.
[327] Tr. 2956. (2955, 2956).
[328] Id.
[329] Dr. Nancy W. Walls, p. 1
[330] FES 5.5.2.6.
[331] FES 5.5.2.3.
S 5.5.2.2.[332]

and larvae will be from a general population rather than a local one and will be only a small fraction of the numbers passing the area. Accordingly the Staff sees no measurable effect on the local oceanic ecosystem from their passage through the plant.[333] The Board agrees and so finds. In its evaluation the Board also recognized that during discharge of warm water from the plant, planktonic organisms in the ocean will be mixed in varying proportions into the discharge plume and its thermal and chemical content. As the plume mixes with ambient ocean water, both the incremental temperature and the concentrations of chemicals will rapidly increase. While chlorine residuals will likely not be measurable, the combined effects of heat and chemical forms may have some detrimental effect on phyto-plankters entrained into the plume; however, as the exposure time will be short and the concentrations will be decreasing, mortalities to plankters should not result in a measurable change in the population of organisms in the local ecosystem.[334] The Board concludes that, based on the evidence of record, the overall additional impact of Unit No. 2 with respect to thermal and chemical discharges will be minor and relatively insignificant.

112. The Board heard considerable testimony on possible radiological impact as set forth in paragraphs 13 through 31, above. While the Applicant and Staff calculations agreed that the facility releases are "as low as practicable", Dr. Morgan questioned the calculations because of what he thought were wide disparities in the I-131 releases.[335] However, the Board notes that it was only portions of the I-131 source term which were in disagreement (only a minor part of the I-131 releases) and that such differences were adequately explained by the assumptions used in the calculations.[336] Since the total source terms for I-131 as calculated by the Applicant and Staff were reasonably close,[337] and since it is the total source term from which doses were calculated,[338] the Board finds the differences cited would not amount to error significantly affecting "as low as practicable" criteria. Dr. Morgan also noted that carbon-14 was improperly omitted from source term Table 3.3 for liquid releases. However, in considering the matter, the Board concludes that while this may have been the case, nevertheless it is a harmless omission since Dr. Morgan also agreed that the C-14 dose would not exceed the Staff's "as low as practicable" guidelines.[339] Dr. Morgan questioned the accuracy of FES Table 3.3 because it seemed to exclude radionuclides on the basis of concentration rather than biological

[333] FES 5.5.2.3.
[334] FES 5.5.2.5.
[335] Testimony of Dr. W. Morgan; Tr. 2885; see paragraph 18, *supra*.
[336] FES 3-29.
[337] Tr. 3063.
[338] Tr. 3063-64.
[339] Tr. 3116.

risk[340] and because certain actinide isotopes did not appear in this table.[341] As to the first point, Staff testified that the selection of the concentration level used was on the basis of a generic evaluation which took into account the biological risks associated with individual radionuclides and such that the most critical isotopes, if present at that concentration, would produce negligible doses to individuals and populations.[342] As to the actinide isotopes, the Staff testified that they were considered but that their releases were far below the 5×10^{-6} curies per year cutoff.[343] Dr. Morgan agreed that the dose from these isotopes would not exceed 1 mrem/year.[344] Accordingly, the Board concludes that Staff's review of the release and dose calculations is adequate and that the St. Lucie 2 facility will meet the "as low as practicable" criteria and that any cost factor resulting from genetic and somatic effects on the population or any identified segment of it is slight and would not appreciably affect the cost-benefit balance in favor of construction. The Board was impressed by the thoughtful and expert manner in which Dr. Morgan assisted in developing the record. In essence, Dr. Morgan's testimony was that while the cost-benefit balance favored the construction of St. Lucie 2, there were certain actions that could be taken to minimize the costs and optimize the benefits. However, the suggestions of Dr. Morgan contemplate revision of the Commission's Regulations, and as such are outside of the jurisdiction of this Board. Nevertheless, it appears to the Board, on the basis of the record to date, that Dr. Morgan's opinion on the need for updating the calculations and methodology used by the Staff with respect to the "as low as practicable" guidelines and his opinion on the use of the "dose commitment" concept are of such importance as to require further development of the record. Such development will be undertaken during the course of the health and safety hearings so that the Board may determine if need exists for the referral of these matters to the Commission.

113. The Applicants have submitted a proposed preoperational and operational environmental monitoring program which has been reviewed by the Staff and approved subject to a number of conditions and recommendations.[345] The Board adopts these recommendations herein as a condition of any authorization for construction issued pursuant to this Initial Decision.

114. The Board reviewed the need for power and the forecasting methodology used by Applicant in connection with Contention 1.3 above. Based

[340] Tr. 2887, 3150-51.
[341] Tr. 3179.
[342] Tr. 3210-3211, 3228-3235.
[343] Tr. 3216-3221.
[344] Tr. 3186.
[345] FES Section 6.1.

on the record addressed, the Board is convinced that the growth rate predicted for Florida and the Applicant's service area is reasonable, that Florida will continue to grow at a faster rate than the nation as a whole, that the demand for electric power will likewise increase, that sufficient power is not available from outside the Applicant's system, and that the need for the St. Lucie Unit No. 2 has been adequately demonstrated.

Alternatives to St. Lucie 2

115. The Staff considered the construction of an equivalent fossil fuel power plant at the Hutchinson Island site.[346] Oil has been the major fuel used for electric power generation in Florida; coal has not been a major fuel source because of long distances to sources of supply and high shipping costs. The volume of solid and gaseous waste products produced by fossil fuel units, especially coal, can be a significant environmental problem. In addition, environmental impacts result from the delivery and storage of fossil fuels. Oil or coal plants require several barge shipments per week, and with oil there is the attendant risk of spills.[347] Oil is also objectionable because of uncertainty of supply and increasing cost.[348] The Board also agrees with the Staff that conversion of the present plant to a fossil facility is feasible but involves large cost penalties with no significant net improvement in environmental impact. A fossil plant would produce less waste heat (although the environmental effects of heat from the proposed nuclear facility are considered insignificant) but substantial solid waste products. Based on the evidence of record, the Board concludes that nuclear fuel is the best alternative.

116. The Staff considered the installation of nuclear facilities at another site.[349] Other coastal sites showed no significant advantages; inland sites showed higher ecological and construction costs.[350] As noted in greater detail above, a decision not to construct the plant will result in inadequate reserves for the Applicant's system after 1979, with increasing risk of load curtailments. Sufficient power is not available from deferred retirement of existing units or from outside the Applicant's system.[351] Accordingly the Board finds that the selection of the St. Lucie site results in a lower economic and ecological cost and earlier provision of the needed power. Since other sites do not appear to have a potential for a significantly lower environmental impact, the St. Lucie site, with

[346] FES 9.1.3.
[347] FES 9.1.3.
[348] Tr. 691-693.
[349] FES 9.1.2 and Table 9.1.
[350] Id.
[351] FES 9.1.1.

the major environmental costs already absorbed by reason of St. Lucie 1, would appear to be the best site available for St. Lucie 2.

117. The Board has discussed alternatives relating to ultimate heat sink methods in connection with Contention 1.6 above. In addition, the Board notes that the Staff examined alternatives to the proposed cooling system, including ponds or canals, dry cooling towers, and natural and mechanical draft saltwater cooling towers and did not find them acceptable alternatives.[352] Sufficient surface area does not exist for ponds. Dry cooling towers have not been developed in a size capable of meeting the cooling needs of the proposed plant,[353] and natural and mechanical draft saltwater cooling towers would result in significant environmental impact from noise, salt carryover, drift, and size.[354] The Board has considered the alternatives presented and agrees therewith as augmented and modified by the Board as set forth in paragraph 51 above to incorporate in the FES the testimony offered in connection with Contention 1.6. In view of the record, including the said modification of the FES, the Board concludes that the present St. Lucie design is the best environmental choice of alternatives.

D. Compliance with FWPCA

118. By letter dated May 28, 1974, the State of Florida Department of Pollution Control (DPC) certified to Applicant that, in accordance with Section 401 of the Federal Water Pollution Control Act Amendments of 1972 (FWPCA or Act), as of the issue date, there were no effluent limitations under Sections 301(b) or 302 nor standards under Sections 306 and 307 of the Act which were applicable to St. Lucie Unit No. 2.[355] On October 8, 1974, the Environmental Protection Agency (EPA) published as regulations these limitations and standards.[356] By letter of November 25, 1974, the DPC stated that, notwithstanding issuance of these EPA regulations, DPC had no intention of issuing further certification or modifying its May 28, 1974, certification pursuant to Section 401 of FWPCA.[357] In addition, the Board inquired as to Applicant's compliance with Florida state law.[358] On October 3, 1974, the Florida Pollution Control Board (PCB) issued a variance for St. Lucie 2 from certain conditions relating to temperature and mixing zone which the Applicant is committed to discharge. The variance also notes Applicant's duty to comply

[352] FES 9.2.
[353] FES 9.2.3.
[354] Id., 9.2.4.
[355] Applicant's Exhibit 6.
[356] 39 *Fed. Reg.* 36176, Tr. 3294.
[357] Applicant's Exhibit N0.
[358] 38 *Fed. Reg.* 2079, Jan. 29, 1973.

with all applicable statutes, rules, and regulations of the DPC and PCB other than those from which a variance has been obtained. Accordingly, and with reference to the Commission's Interim Policy Statement (IPS),[359] the Board finds that the May 28, 1974, certification satisfies the requirements of Section 401 of the FWPCA.

E. Cost-Benefit Analysis

119. Both the Applicant and Staff prepared cost-benefit analysis for the St. Lucie Unit No. 2 facility. The costs included:

(a) Small discharges of particulates and radionuclides released to the air and water from facility, but in view of the findings above these discharges will have no serious impact.

(b) Losses of aquatic life due to capture of fish on intake structure screens, plus passage of small fish, organisms, and fish eggs through the circulating water system. As indicated above, this loss has been calculated and evaluated to be minor.

(c) Discharge of relatively negligible amounts of sodium sulfate and chloride to the ocean.

(d) Aesthetic impact as indicated above. In view of the construction of Unit 1, the additional aesthetic impact of Unit 2 is slight.

(e) Discharge of heat into the Atlantic Ocean imposes minimal adverse environmental impact as more fully discussed above.

(f) As noted above, the incremental use of land occasioned by the construction of Unit 2 at the same site as St. Lucie Unit 1 is essentially zero. In addition, with both units in operation, only approximately ¼ of the site acreage will be used for power plant purposes and the rest of the site will be left in its natural state.

(g) The economic costs approximate $500 million.

120. The Board has considered the Staff's cost-benefit analysis[360] and further reviewed it in light of the evidence of record. The Board concludes that the benefits far outweigh the identifiable environmental costs. In arriving at this conclusion, the Board independently considered the effects of the uranium fuel cycle activities as quantified and set forth in Table S-3 of Appendix D[361] and concluded that these effects would not materially change the results of the cost-benefit analysis.

[359] Tr. 3295-6.
[360] FES p. 10.4.2.
[361] Appendix D to 10 CFR Part 50 (10 CFR 50.20(c)).

F. LWA-2 Activities

121. The proposed facility will be similar to its sister Unit No. 1 previously authorized for the site and under construction. As noted above, the Board has considered the criteria concerning site suitability as set forth in 10 CFR Part 100. In addition, since some of the work activity proposed by the Applicant[362] is subject to the Quality Assurance provisions of 10 CFR Part 50, Appendix B, the Board must determine that there are no unresolved safety issues, relating to the work activities requested, before these activities may be authorized by the Director of Regulation.

122. The Staff has reviewed all of the activities requested by the Applicant and concluded that the only activities involved are those relating to the construction of reinforced concrete base, mat, and walls below grade both for the reactor building and for the intake structure. The former supports the primary containment vessel and the shielding building; the latter supports, *inter alia*, the intake cooling water pumps.[363] The Board concurs.

123. The Staff has reviewed the Quality Assurance programs of the Applicant and its major contractors in considerable detail and in a thorough manner. They concluded that Applicants' QA program is consistent with 10 CFR Part 50, Appendix B, and the commitments made in the application.[364] The Board agrees with the procedures and extent of review conducted by Staff. In addition, the Board examined the Applicant's technical qualifications and QA program.[365] Based thereon, the Board concludes that the Applicant will provide a quality assurance organization that can properly implement the quality assurance programs designed to insure that the requirements of Appendix B to 10 CFR Part 50 are met with respect to any LWA-2 activities authorized.

G. Site Redressibility

124. The Board raised the issue regarding the redress of the site should LWA activities be authorized and undertaken and the construction permit ultimately be denied. The extent to which such LWA activities can be redressed is considered as part of the cost-benefit balance to be performed by the Board and becomes a primary factor if the construction permit were to be ultimately denied. This factor is relatively minor in this case because the site already has been cleared and prepared for the construction of Unit No. 1. Adding a second unit to the site would entail little additional site preparation. The Applicants

[362] Letter to the Commission dated June 28, 1974, requesting a limited work authorization pursuant to 10 CFR 50.10(e) and to construct structural foundations.

[363] Staff Witness Calvin W. Mann following testimony Tr. 3342.

[364] Id., at p. 13.

[365] Testimony of R. G. Cockrell following Tr. 3015.

have committed to redress the site to the condition existing before the commencement of the LWA activities should the construction permit be ultimately denied.[366] The Board concludes that the measures to be undertaken to redress the site, should this be required, are acceptable and do not materially affect the cost-benefit balance. Thus, should the construction permit for St. Lucie Unit No. 2 be finally denied following the health and safety phase of this proceeding and should LWA activities be undertaken in the interim, the Applicant will redress the site in accordance with commitments made during the course of this proceeding as noted in the record of this case.

III. Conclusions of Law and Decisional Conditions

125. Based on the entire evidence of record and the findings above, and subject to the conditions set forth in paragraphs 126 and 127 below, the Board concludes that:

(a) the environmental review conducted by the Regulatory Staff pursuant to the National Environmental Policy Act of 1969 (NEPA), as further modified and augmented herein, is adequate;

(b) the requirements of Section 102 (2)(C) and (D) of said NEPA, and Appendix D to 10 CFR Part 50 of the Commission's regulations have been complied with in this proceeding;

(c) the requirements of Section 401 of the Federal Water Pollution Control Act amendments of 1972 have been met;

(d) there is reasonable assurance that the St. Lucie site is a suitable location for nuclear power reactors of the general size and type proposed from a radiological health and safety standpoint;

(e) following independent review by the Board of the proposed construction work to be performed pursuant to 10 CFR 50.10(e)(3), there are no unresolved safety issues precluding the issuance of such limited work authorization;

(f) the balance among conflicting environmental and site suitability factors herein, including a weighing of the benefits and costs at this initial phase of the proceedings, favors the issuance of the construction permits for the proposed St. Lucie Nuclear Power Plant Unit No. 2, subject to the conditions set forth in paragraph 126 below.

126. Based upon the findings above, the Board concludes that the following conditions for the protection of the environment shall be incorporated in any

[366] Applicant's Witness R. A. Delorenzo following Tr. 2288; Tr. 2303-4.

construction authorization or permit issued for the proposed St. Lucie Nuclear Power Plant Unit No. 2:

(a) the six recommended conditions set forth at p. v-7 of the Final Environmental Statement for St. Lucie No. 2 are approved and adopted as conditions herein;

(b) the Applicant shall monitor the actual location of milk cows during plant operation, at time intervals to be specified by the Staff, for the purpose of continuing appraisal of population doses;

(c) the Applicant shall utilize a figure of 75 man-rem/yr as a guideline dose for in-plant occupational exposure;

(d) the recommendations of the Staff as set forth in paragraph 59 above shall be made part of the technical specifications of St. Lucie Unit No. 2;

(e) the Applicant will undertake the additional engineered safety features (ESF) required to reduce offsite doses to values below the guidelines of 10 CFR Part 100 at a distance of one (1) mile as specified in paragraph 83 above;

(f) the Applicant shall improve the in situ soils as recommended by the Staff so that the canal barrier and the slopes between the canal barrier and the plant will not fail;

(g) the Applicant shall monitor actual fish entrapment in the intake canal and otherwise comply with the Staff recommendation as set forth at FES 4.5.2(2);

(h) the Applicant shall comply with the Staff recommendation regarding the operation of discharge lines as set forth in paragraph 102 above;

(i) the Applicant shall not draw more than four (4) million gallons of water per year from Big Mud Creek for routine testing;

(j) the Applicant shall monitor chlorine and chlorine residuals as recommended by the Staff and set forth at FES 5.2.3;

(k) the Applicant shall monitor the thermal field after Unit No. 1 is operational as set forth in paragraph 110 above;

(l) the Applicant shall continue the turtle nest surveys and studies to determine any plant impact thereon. The Applicant shall deliver such studies and survey data to the Staff and shall undertake to promptly publish the data and conclusions therefrom; and

(m) the Applicant shall undertake the preoperational and operational monitoring program as approved with conditions and recommendations by the Staff.

127. The Final Environmental Statement for the St. Lucie Nuclear Power Plant Unit No. 2 is approved as corrected and amended, including the following modifications:

(a) The population data presented in the FES is corrected as indicated in the "Supplementary Testimony of AEC Regulatory Staff on Changes to FES

Related to Population" by Francis St. Mary (following Tr. 2353 as corrected at Tr. 2696).

(b) The FES is hereby supplemented to include the testimony in this proceeding of John Young and John R. Fotheringham related to alternative ultimate heat sink methods.

(c) The FES is hereby supplemented to include the testimony in this proceeding of Jacob Kastner related to Table 3.3 as follows:

The note appearing at the bottom of Table 3.3 at page 3-26 of the FES is augmented and revised to read:

Note: Isotopes less than 5(−6) Ci/yr are not listed. Such isotopes have been investigated and their biological effects were determined to be negligible.

ORDER

Based upon the Board's Findings and Conclusions in this Partial Initial Decision, which shall be incorporated into and constitute a portion of the Initial Decision to be issued as to the St. Lucie Unit No. 2 facility upon completion of the radiological health and safety portion of this proceeding, it is ordered that:

In accordance with Sections 2.754, 2.760, 2.762 and 2.764(a) of the Commission's Rules of Practice, 10 CFR Part 2, this Partial Initial Decision shall be effective immediately and shall constitute the final action of the Commission thirty (30) days after issuance, subject to any review pursuant to the Rules of Practice. Exceptions to this Partial Initial Decision may be filed by any party within seven (7) days after service of this Partial Initial Decision. A brief in support of the exceptions shall be filed by interested parties within fifteen (15) days thereafter, and within twenty (20) days by the Regulatory Staff. Within fifteen (15) days after service of the brief of appellant (twenty (20) days in the

case of the Regulatory Staff), any other party may file a brief in support of, or in opposition to, the exceptions.

It is so ORDERED.

ATOMIC SAFETY AND
LICENSING BOARD

David L. Hetrick, Member

Frank F. Hooper, Member

John B. Farmakides, Chairman

Dated at Bethesda, Maryland,
this 28th day of February 1975.

(The Appendixes are omitted from this publication, but they are available from the Commission's Public Document Room, Washington, D. C.)

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

LBP-75-25

ATOMIC SAFETY AND LICENSING BOARD

John B. Farmakides, Chairman
David L. Hetrick, Member
Frank F. Hooper, Member

In the Matter of

FLORIDA POWER & LIGHT COMPANY

(St. Lucie Nuclear Power Plant Unit No. 2)

Docket No. 50-389

April 25, 1975

Upon applicant's petition for reconsideration of several findings of partial initial decision (LBP-75-5), Licensing Board (1) withdraws its findings on guideline dose for occupational exposure of plant personnel and leaves such matter for further consideration at the health and safety hearing, where staff proposes to offer additional evidence; (2) clarifies and reaffirms its finding on sewer line connection to the plant; and (3) reaffirms its ruling requiring further consideration of stalled hurricanes at the health and safety hearing.

Petition for reconsideration denied in part, and granted in part.

NEPA: COST-BENEFIT BALANCE

In arriving at the environmental cost of the total genetic radiation dosage to be received by the entire population, the genetic dose to plant personnel should be considered as a dose to future generations and should be weighed along with the dose to non-employees.

SUPPLEMENT TO THE BOARD'S PARTIAL INITIAL DECISION RE APPLICANT'S PETITION FOR RECONSIDERATION

1. On March 19, 1975, the Florida Power & Light Company (Applicant) filed a Petition for Reconsideration of the Board's Partial Initial Decision—Environmental and Site Suitability (dated February 28, 1975). The Applicant requested reconsideration of the Board's findings relating to: (a) guideline dose

for plant personnel, (b) sewer line connection to the plant, and (c) the need for further consideration of stalled hurricanes.

2. On March 25, 1974, Martin H. Hodder, *et al.*, (Intervenors), filed a motion for a 7-day extension of time to respond to the Applicant's petition. On March 28, 1975, following a telephone conference call in which the parties indicated no objection provided their time likewise was extended and that any such extension did not waive any rights they may have to object to Intervenor's response, the motion was granted. Pursuant thereto, on April 7, 1975 the Intervenors filed a response in which they objected to each of the requests made by the Applicant, and in addition the Intervenor stated as follows:

> . . . . pursuant to 10 CFR 2.73 also make an offer of proof of their contentions by offering the ASLB the following evidence which has just become available and is new information. . . .

With respect to this "offer of proof" the Board considers it to be a motion to reopen the record, not directly related to the petition before us, and will so treat it in a separate memorandum and order.

3. With respect to the three issues raised by the Applicant in its petition for reconsideration, the Board will treat each in turn. As to the issue involving the use of 75 man-rem/yr as a guideline dose for occupational exposure, the Board notes as follows: From the point of view of the cost-benefit analysis performed by the Board, the environmental cost in terms of the total genetic dose received by the entire population—including plant personnel—is a primary factor. In such a balance the genetic dose to plant personnel should be considered as a dose to future generations and should be weighed along with the dose to non-employees. As the Applicant and Staff correctly point out, the 450 man-rem/yr figure maximizes the genetic costs, and the Board adopted this figure for purposes of conservatism in evaluating this factor among others in the cost benefit balance. The record is clear that even with the 450 man-rem/yr figure the cost-benefit balance from an environmental viewpoint is in favor of the construction of the plant. However, the balance becomes even more favorable if the 75 man-rem/yr guideline is used. Thus, several factors led the Board to recommend the 75 man-rem/yr limitation: the fact that the cost benefit balance can be further improved by reducing the plant personnel dose from 450 man-rem/yr to 75 man-rem/yr; the possibility of reducing the in-plant exposure to operating personnel; and the fact that the Licensing Board, designated for Unit No. 1 (construction of which produced the initial, major environmental impact compared to the relatively minor impact of the construction of Unit No. 2), used the 75 man-rem/yr in its NEPA cost-benefit balance. The Board also considered that this guideline would provide further incentive to the Applicant to do everything reasonable within its power to minimize exposures to plant personnel. This would include continual surveillance and review of policies, procedures, processes, and equipment, as well as a continual evaluation of

technological advances, new processes, and improved equipment as they become available.

4. The Applicant and Staff are persuasive in showing the Board that there may be a need to relax the 75 man-rem/yr limitation under certain conditions involving unplanned-for maintenance and emergency operation. Thus, as a consequence of reexamining the entire record on this point, the Board was predisposed and prepared to reaffirm its finding with some modification to require: (1) the establishment of a range of 75 man-rem/yr up to 450 man-rem/yr as a guideline dose for in-plant occupational exposure; (2) adherence by the Applicant to the 75 man-rem/yr level for as many years as possible; (3) at the point when the Applicant could no longer adhere to the 75 man-rem/yr limitation, then the Applicant would so justify to the Staff and request an upward revision of the limitation to a reasonably higher level not to exceed 450 man-rem/yr. However, in view of the statements of Applicant and Staff, especially the Staff's position that additional evidence they propose to present at the forthcoming hearing on radiological health and safety would clarify the matter, the Board concluded that this subject matter should be considered further at the forthcoming hearing, that the record with respect to it should not now be closed, and that it does not materially affect the Board's other environmental and site suitability findings. Therefore the Board's previous findings with respect to this issue should be withdrawn and the matter considered further at the next hearing. Accordingly, the Board hereby rules as follows:

(1) the last sentence of paragraph 28, and the entire paragraph 126(c) is hereby cancelled;

(2) the subject matter will be considered in greater detail by the Board at the forthcoming radiological health and safety hearings; and

(3) the Staff shall offer further evidence on this matter at the health and safety hearing. The other parties may do likewise.

5. With respect to the sewer line issue the Board notes that the Staff, in its consideration of the disposal of wastes problem (FES 3.7.1) recognized that the Applicant's system will normally be adequate, but also recognized that "plugging problems" may occur. The Staff therefore recommended that the Applicant connect into the municipal sewage treatment facilities "as soon as a sewer line is installed down the island".[1] Primarily because of such potential plugging problems and in view of the entire record, the Board concluded that a connection should be made within a reasonable time; and that requiring the

[1] The Staff's language "down the island" is not clear as to the time or circumstances under which connection to sewer facilities should be required. Therefore in setting the five mile distance, one of the Board's reasons was to correct this potential ambiguity.

Applicant to connect when the line on the Island came within five miles of the plant site was fair and reasonable to all parties. By specifying a five mile distance for connection with municipal facilities, the Board has no intention of requiring the Applicant to extend a sewer line across the Indian River.

6. Accordingly, the Board hereby (a) cancels the last sentence of paragraph 105 and substitutes in lieu thereof, the following:

> The Applicant has committed itself to connect with municipal sewage treatment facilities if and when a sewer line is extended to the Applicant's site. However, in view of the entire record, including FES 3.7.1, the Board finds that such a connection should be made as soon as a sewer line on Hutchinson Island is brought within approximately five miles of the plant and hereby makes this a condition for construction of St. Lucie Unit No. 2.

(b) Paragraph 126 is amended to add the following subparagraph:

> (n) The Applicant shall connect into the municipal sewage treatment facilities as soon as a sewer line on Hutchinson Island is brought within approximately five miles of the plant site.

7. After review of Applicant's petition with respect to the stalled hurricane issue, and the objections thereto of the Staff and Intervenors, the Board reaffirms its position that stalled hurricanes must be considered at the next hearing. The Staff has correctly noted that there may be hurricane conditions which may result in erosional damage greater than proposed at the environmental hearings. The Applicant has correctly pointed out that a PMH is a hypothetical hurricane with the most severe characteristics that can occur in a given region. By definition a PMH is a moving hurricane; there is nothing in its definition to indicate that such a storm, or a storm of lesser intensity, might not stall, adjacent to a coastline for a period of 2 to 4 days. Therefore the record is not clear as to possible damage arising from combination of a hurricane of maximum, or near maximum, intensity and of maximum duration. Evidence in the record shows that hurricanes frequently slow down, stall and increase in intensity. In the Board's opinion any additional erosional impact to the site that may occur because of a combination of high intensity, long duration hurricanes is not likely to make the site unsuitable. However, this type of impact may require additional safety related structures beyond those considered by the Board in its Partial Initial Decision. Therefore to make an adequate evaluation of the potential hurricane damage to safety related structures, the Board needs additional information on: the expected frequency of high intensity, long duration hurricanes at the St. Lucie site; and on the expected erosional damage to the Island and to the St. Lucie plant from such hurricanes.

In summary, the Applicant's petition for reconsideration is denied in part and granted in part. The Board's Partial Initial Decision—Environmental and Site

Suitability, is modified as further specified and set forth above as to paragraphs 28, 105, 126(c) and 126(n).

It is so ORDERED.

ATOMIC SAFETY AND
LICENSING BOARD

David L. Hetrick, Member

Frank F. Hooper, Member

John B. Farmakides, Chairman

Dated at Bethesda, Maryland,
this 25th day of April 1975.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

LBP-75-26

ATOMIC SAFETY AND LICENSING BOARD

J. B. Farmakides, Chairman
D. L. Hetrick, Member
F. F. Hooper, Member

In the Matter of

FLORIDA POWER & LIGHT COMPANY

(St. Lucie Plant, Unit No. 2)

Docket No. 50-389

April 25, 1975

Upon intervenors' motion to reopen the record to admit report as new evidence, Licensing Board finds that report offered (1) does not materially affect the partial initial decision, which was based on an adequate record and supported by substantial evidence; (2) is not at this time to be considered the position of the State of Florida; and (3) is not timely offered, since it does not appear to constitute new evidence related to the contested issues.

Motion to reopen the record denied, without prejudice to intervenors' offering said report at forthcoming health and safety hearing.

RULES OF PRACTICE: PETITION TO REOPEN THE RECORD

A Licensing Board is expected to reopen the record when matters of "major significance to plant safety" are raised, regarding either previously admitted contentions or new issues. See *Vermont Yankee* (ALAB-124).

MEMORANDUM AND ORDER ON INTERVENORS' MOTION TO REOPEN THE RECORD

In a "Supplement to the Board's Partial Initial Decision re Applicant's Petition for Reconsideration", issued this date, the Board supplemented its Partial Initial Decision with respect to three issues. In addition, in said

supplement, the Board noted that "Intervenors' Response to Applicant's Petition for Reconsideration and Offer of Proof", dated April 7, 1975, not only controverted the Applicant's petition for reconsideration, but also made an "offer of proof" of certain alleged new evidence.[1] The Board considered the "offer of proof" of new evidence to be a separate motion to reopen the record and ruled that it would be treated in a separate memorandum and order.

The Intervenors do not state with specificity the purpose for which their "offer of proof" is made other than that the report[2] " . . . constitutes new information and as such there is good cause for receiving said document into evidence. . . ." The Intervenors also include extracted portions of the report in their response apparently to demonstrate that dose guidelines should be as low as practicable, not a matter in issue here.

As clearly set forth in *Vermont Yankee Nuclear Power Corporation* (ALAB-124, RAI-73-5, p. 365), a Licensing Board is expected to reopen the record when matters of "major significance to plant safety" are raised, either as to previously admitted contentions, or on new issues. While the Intervenors' Response is not without ambiguity, the Board treated the Intervenors' "offer of proof" as a motion to reopen the record since Intervenors had cited "10 CFR 2.73 [sic]" and because they alleged that the "offer of proof" contained new information. The specific requirements of 10 CFR 2.730(b) were not observed; however, this factor was not the controlling element in the Board's decision as stated below.

The "document" is a lengthy report of approximately 459 pages, apparently prepared by a certain "Power Plant Siting Committee, Florida International University, Daniel F. Jackson–Project Director, and Michael F. Chenoweth–Research Associate, Division of Environmental Technology & Urban Systems, School of Technology." It was prepared under a contractual arrangement with the State of Florida Department of Pollution Control.

Intervenors apparently contend that this report represents a State of Florida position. The Board does not agree. As stated by Applicant, it appears to be nothing more at this time than a report prepared as one step in a multi-step process leading to a final State position on the matter. Thus, the Board does not consider the report to be the position of the State of Florida at this time.

A preliminary review of the report shows it to be an accumulation of materials, a critique based thereon, and conclusions. While some of the conclusions are contrary to those arrived at by this Board, we are not persuaded thereby that said report materially affects our Partial Initial Decision sufficiently so as to require a reopening of the record. The findings of the Board were

[1] The document (459 pages) so offered as new evidence is entitled "Final Report—Review of Application for Site Certification, Florida Power and Light Company, St. Lucie Plant No. 2, Hutchinson Island by Power Plant Siting Committee, Florida International University, 10 January 1975."

[2] *Id.*

supported by substantial evidence and based on an adequate record developed by all the parties. Moreover, the hearing record includes the benefit of cross-examination, and Board questions and responses thereto, for further testing and clarification. Based on initial review, it appears that most of the compilation of documents in the report pertaining to the contested issues are not new evidence.

In addition, absent a clear identification by the Intervenors of what portion, or portions, of the report contains new evidence that may add to or expand the scope of the previously admitted contentions, and since the report is primarily an accumulation of papers and documents already in the record, or previously available to the parties, the Board considers the "offer of proof" to be untimely.

Furthermore the reliability and credibility of certain portions of the report have been seriously questioned. The Applicant asserts that the extracts of the report, included in the Intervenors' April 7 response to the Applicant's petition, contain substantial errors which the Applicant proceeds to identify at length and with great specificity. Without ruling thereon at this time, the Board will afford an opportunity to the Intervenors to offer the report at the forthcoming hearing on health and safety.

Accordingly, the motion to reopen the record to admit the above identified report as new evidence is denied without prejudice to Intervenors to offer said report at the forthcoming hearing on radiological health and safety.

It is so ORDERED.

ATOMIC SAFETY AND
LICENSING BOARD

David L. Hetrick, Member

Frank F. Hooper, Member

John B. Farmakides, Chairman

Dated at Bethesda, Maryland
this 25th day of April 1975.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ALAB-335

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Michael C. Farrar, Chairman
Richard S. Salzman
Dr. W. Reed Johnson

In the Matter of

Docket No. 50-389

FLORIDA POWER & LIGHT COMPANY

(St. Lucie Nuclear Power Plant,
Unit No. 2)

Upon appeal by intervenors from the Licensing Board's partial initial decisions (LBP-75-5 and LBP-75-25) making environmental and site suitability findings requisite to the issuance of a limited work authorization (LWA), the Appeal Board rules that (1) the Licensing Board correctly decided that the site complies with the Commission's siting criteria; (2) in light of the staff's post-argument disclosures regarding the method by which it evaluated alternative sites, the record does not support the Board's summary rejection of the intervenors' contention concerning the adequacy of such evaluation; and (3) all other exceptions raised by intervenors are without merit. Upon appeal by applicant from construction-permit condition imposed upon it, the Appeal Board rules that the Licensing Board did not adequately justify that condition and, hence, vacates the condition, leaving it open to the Licensing Board to reinstate the condition and articulate its reasons for doing so.

Partial initial decision affirmed in part and reversed in part; matter remanded to the Licensing Board. Pending the decision on remand, outstanding LWA permitted to remain in effect.

RULES OF PRACTICE: BRIEFS

Exceptions may be grouped into categories for the purpose of briefing.

EXCLUSION AREA: SIZE
LOW POPULATION ZONE: SIZE

Under 10 CFR Part 100, the smaller an exclusion area and a low population zone are drawn, the greater the efficacy of the safety devices built into the plant must be in order to retain post-accident radiation dosages below the guideline levels.

LWA: STATUS PENDING PROCEEDINGS ON REMAND

Pending resolution of remanded questions, an LWA may remain in effect in circumstances where little consequential environmental damage will occur.

RULES OF PRACTICE: OPPORTUNITY FOR PARTIES TO ADDRESS FACTUAL ISSUES RAISED BEFORE APPEAL BOARD

Where factual disclosures to Appeal Board reveal a need for further development of the evidentiary record of a proceeding, all parties are entitled to have an opportunity to test such facts and to participate fully in the resolution of the issues involved.

TECHNICAL ISSUES DISCUSSED: Consideration of alternative sites.

Messrs. Harold F. Reis, Washington, D.C., and **Norman A. Coll**, Miami, Florida (with whom **Mr. Anthony J. Gambardella, Jr.**, Washington, D.C., was on the briefs), for the applicant, Florida Power & Light Company.

Mr. Martin Harold Hodder, Miami, Florida, *pro se* and as counsel for Rowena E. Roberts, *et al.*, intervenors.

Mr. James R. Tourtellotte (with whom **Messrs. Perry B. Seiffert** and **Edward Ketchen** were on the briefs) for the Nuclear Regulatory Commission Staff.

DECISION
June 29, 1976

In this construction permit proceeding, the Licensing Board has made environmental and site suitability findings entitling the applicant Florida Power & Light Company to begin work of a limited nature on a second nuclear unit at its St. Lucie site on Florida's east coast.[1] Although the applicant has taken exception to one narrow aspect of the decision below,[2] the principal questions before us on appeal have been raised by the intervenors. Our primary concern is with two of the several basic claims which underlie the 45 exceptions which they

[1] LBP-75-5, 1 NRC 101 (1975), as supplemented LBP-75-25, 1 NRC 463 (1975). As we understand it, the applicant has just this month begun to put its limited work authorization to use; prior to that time it had been awaiting receipt of necessary approvals from the appropriate State authorities.

[2] See Part V, *infra*.

filed:[3] (1) that, contrary to the Board's findings, the size of the population surrounding the site—which is on Hutchinson Island just south of Fort Pierce—is likely to exceed the Commission's limitations; and (2) that the Board below should not have summarily rejected their contention, which was premised on the requirements of the National Environmental Policy Act, that inadequate consideration had been given to alternative sites for the plant.

At the oral argument on the appeals, we pursued both questions at some length. Several days later, staff counsel advised us by letter that, contrary to suggestions made earlier, "only one specific alternative site was considered" by the staff in the course of its review of the application and that the precise location of even that site was unknown to it.[4] This disclosure led us first to call upon the staff for a fuller explanation of the process it had followed in considering alternative sites and then to give all parties the opportunity to brief us on what steps we should take in light of those disclosures.

As we explain in Part I of this opinion, the Board below correctly decided that the St. Lucie site did not run afoul of relevant Commission standards concerning nearby population. This conclusion does not end the inquiry, however, for it does not rule out the possibility that there exists some better site, population and all other factors considered. On this score, we conclude that it would be inappropriate to attempt to pass now upon the merits of the method by which the staff approached the question of alternative sites. For, as we discuss in Part II, we are convinced that not until the matter came before us was there a fair disclosure of just what that method entailed. In other words, both the Board below and the intervenors were kept in the dark on this subject; this being so, the record below cannot support the Board's summary rejection of the

[3] The intervenors referred in their briefs to only 28 of their 45 exceptions. Because one of those briefed involved a threshold procedural matter, we disposed of it at an earlier stage of this proceeding. See ALAB-274, 1 NRC 497 (1975). The remainder were grouped into eight categories for purposes of briefing, as it is quite proper to do. See *Long Island Lighting Company* (Shoreham Station), ALAB-156, 6 AEC 831, 832 (1973). Other than the two points referred to above, none of the intervenors' arguments warrants more than cursory mention here. See Part III, *infra*.

Some of the seventeen exceptions not specifically referred to in the intervenors' brief are implicitly encompassed within the arguments they presented there. While we are free to disregard the remainder, which were entirely unbriefed (see *Northern Indiana Public Service Company* (Bailly Nuclear-1), ALAB-207, 7 AEC 957 (1974)), we have nonetheless examined them. Nothing in them suggests to us a need to look further. See ALAB-156, *supra*, 6 AEC at 833, fn. 10.

[4] Staff counsel, Mr. Tourtellotte, exhibited highly commendable candor in submitting this unsolicited letter. In light of our disposition of the alternate-site issue, we believe it appropriate to note that the staff was not represented by Mr. Tourtellotte when it filed its papers with the Licensing Board in connection with the motion for summary disposition.

intervenors' contention challenging the adequacy of the consideration given by the staff to alternative sites. The intervenors must be afforded a renewed opportunity to demonstrate to the Licensing Board, if they can, that the methods the staff used or the conclusions it reached–as revealed by the staff's post-argument disclosures–are invalid. Because none of the intervenors' other exceptions has merit (see Part III, *infra*), and for the reasons which we set forth in Part IV, the outstanding limited work authorization may remain in effect in the interim.

I. COMPLIANCE WITH POPULATION STANDARDS

A considerable portion of the hearing below involved the presentation of the differing views of each party concerning anticipated population growth in the territory surrounding the reactor. On appeal, the intervenors press their claim that the site does not comport in this respect with the standards established by the Commission's siting criteria (10 C.F.R. Part 100).

We have discussed the nature and application of those standards in considerable detail in other opinions.[5] It suffices to note here that those standards call for the creation of an "exclusion area" and a "low population zone" around a reactor. The applicant must control the territory within the exclusion area. It need not have such control over the low population zone, but there must be a sufficiently small number of people in that zone to assure that steps for their protection (such as evacuation) can readily be taken in the event of an emergency. Equally important, the plant must be designed so that in the event of an accident, radiation dosages at the respective zone perimeters will not exceed certain levels. What this means (all other things being equal) is that the smaller these two areas are drawn, the greater the efficacy of the safety devices built into the plant must be in order to retain post-accident radiation dosages below the guideline levels.[6]

The population standards contain the additional requirement that no "population center" larger than 25,000 persons may be closer to the reactor than one and one-third times the distance from the reactor to the outer boundary of the low population zone. If that requirement is not met, however, a proposed reactor does not necessarily have to be relocated nor an existing one abandoned. Instead, a smaller low population zone may be selected so long as the plant has the capability, or can be redesigned, to limit further the potential radiation dosages that could be encountered at the boundry of that zone.[7]

[5] See *Southern California Edison Co.* (San Onofre Units 2 and 3), ALAB-248, 8 AEC 957, 958-66 (1974); and ALAB-268, 1 NRC 383 (1975); see also *Northern Indiana Public Service Co.* v. *Walton League*, 423 U.S. 12 (1975).

[6] See ALAB-268 (*supra* fn. 5), 1 NRC at 404-06

[7] *Id.* at 406.

The intervenors' arguments, as well as the evidence adduced below, had as their starting point the applicant's proposal that the low population zone would have a five-mile radius. As it had the authority to do, however, the Licensing Board imposed a condition upon the applicant which had the effect of requiring it to utilize only a one-mile low population zone.[8] This had a most significant effect, for the controversy below was concerned almost exclusively with population growth at greater distances. In contrast to the land area lying between one and five miles from the plant, virtually all the land within a one-mile radius of the reactor is owned by the applicant. Accordingly, there is no longer any room for an argument that the population within the low population zone may become too large to permit protective steps, such as evacuation, to be taken in the event of an accident. Nor is there any evidence that projected nearby "population centers" will come too close, *i.e.*, to within one and a third miles of the reactor.

In short, owing to the change in the size of the low population zone, we can readily affirm the Licensing Board's holding that the site complies in all respects with the Commission's siting criteria.[9] That does not, however, end all debate concerning whether the site is an appropriate one. There remains for consideration the intervenors' claim that, notwithstanding that the site meets applicable criteria, a better alternative site may be available. We consider this claim in the next portion of this opinion.

II. THE ALTERNATIVE SITE CONTENTION

A. BACKGROUND

1. As it was required to do, the applicant filed an "Environmental Report" in support of its construction permit application (App. Ex. 4A). That report dealt at one point (Section 9.2) with alternative forms of generating capacity, and included there a discussion of "alternative plant site considerations" (p. 9.2-2). In the course of that discussion, certain general characteristics of both coastal and inland sites were set forth (p. 9.2-2a). At that point, the report

[8] The Board required the applicant to employ additional engineered safety features sufficient to assure that post-accident radiation dosages at a distance of only one mile would be within the limits specified for the LPZ boundary. See 1 NRC at 128 (¶62), 137-38 (¶83), and 157 (¶126(3)).

[9] At oral argument before us, the intervenors expressed some doubt over whether the applicant would conform the plant design to the new requirement. See App. Bd. Tr. 42-43. We note that it was the applicant which first suggested this approach. Quite apart from that fact, however, the intervenors are mistaken if they believe the Board's ruling was merely hortatory. To the contrary, it is binding on the applicant, which must now conform to the condition expressly imposed upon its construction permit if it wishes eventually to obtain an operating license. The applicant recognizes as much. See App. Bd. Tr. 63.

referred specifically to two inland sites, suitable for either fossil or nuclear-fueled plants, on which the applicant intended to build fossil units (*ibid.*). It then explained in brief fashion why the applicant had chosen not to locate the proposed nuclear unit at either of those locations (*ibid.*).

The report went on in its next section (9.3) to compare the St. Lucie site with "another coastal site located within a 40 mile radius near West Palm Beach" (p. 9.3-1). The site was not otherwise identified except insofar as it was said to be "also an off-shore island which is typical of coastal sites along the east coast of Florida" (*ibid.*) and to be approximately ten miles north of the Riviera Beach population center (p. 9.3-2). A comparison of the two sites followed (pp. 9.3-1–9.3-3).

The staff's Final Environmental Statement (FES), issued in May, 1974, contained an even more abbreviated discussion of alternative sites (Section 9.1.2). In that connection, the following appeared (p. 9-2):

> A comparison of the St. Lucie site to another coastal site is presented in Table 9.1. This alternate site can be defined as a typical east coast site, although the specific example used was located within a 40 mile radius of West Palm Beach.[10]

The text went on to include a summary of the comparison appearing in Table 9.1 and to present a very short discussion of the evaluation of inland sites. No further facts relating to alternative sites were presented in the FES.

2. One of the contentions which the Licensing Board originally permitted the intervenors to place in controversy was the following (numbered 1.6(b)):[11]

> Whether the Staff's Final Environmental Statement has sufficiently considered alternatives to the proposed action including * * * alternative sites especially sparsely population areas such as Southwest Florida * * *.

After this contention going to the adequacy of the FES was admitted as an issue, the intervenors sought to discover information from the applicant concerning the site selection process it had gone through and the consideration it had given to alternative sites. Upon receipt of the applicant's responses to their inter-

[10] As may be seen, the staff carelessly characterized the location of the "specific example" to which it referred. The applicant had said that the alternative site was located "within a 40 mile radius", meaning within 40 miles *of the plant*, on the coast "near" West Palm Beach. That description, coupled with the information giving the approximate distance of the site from Riviera Beach, limited the location of the site to a relatively small area. The staff, however, stated that the alternative site was located "within a 40-mile radius of *West Palm Beach*" (emphasis added). That statement carries an entirely different, and much less precise, suggestion as to where the alternative site might be located.

[11] See Prehearing Conference Order, July 12, 1974 (Appendix A to Partial Initial Decision).

rogatories, the intervenors complained that the responses were "unsatisfactory" in that some of them were "incomplete and evasive". For that reason, the intervenors sought to compel further discovery; in particular they expressed the wish to learn "the exact physical location" of any alternative sites that had been considered by the applicant.[12] The Licensing Board rejected their complaint, expressing the view that, while in some respects further information might appropriately be furnished, in large measure the responses were "sufficient".[13]

3. On September 10, 1974, before the Board issued its ruling on the discovery dispute, the applicant moved for summary disposition of the alternative-site contention. Among the material facts about which it claimed there was no dispute were the following: (a) "the Final Environmental Statement considers matters raised by Contention 1.6 in Sections 9.1 and 9.2;" (b) "alternative sites have been considered;" (c) "by locating St. Lucie Unit No. II at the existing St. Lucie site, there will be less environmental impact, less site development and transmission costs, and much less land committed to power plant site use;" and (d) "the St. Lucie site is a more satisfactory location than a site in a sparsely populated area such as Southwest Florida".[14]

The staff supported the applicant's motion, asserting that it "ha[d] considered, and the Staff's Final Environmental Statement (FES) reflects, consideration of alternative sites which include any in Southwest Florida although the FES does not so state explicitly".[15] In furtherance of this assertion, the staff wished to have added to the applicant's list of undisputed material facts the following: (a) "alternative sites have been considered in the Staff's FES;" and (b) "the FES considers inland and coastal sites, which include any in Southwest Florida, although the FES does not so state".[16]

In support of its claim, the staff supplied an affidavit prepared on September 17, 1974 by John R. Young, the head of the staff's team of consultants who had evaluated alternative sites. He indicated (pp. 2-3) that:

> Alternative sites were evaluated by the staff and the results summarized in Section 9.1.2 of the FES. The approach used in that evaluation was a general evaluation of sites throughout the southern and eastern parts of Florida (*i.e.*, the Applicant's service area). Specifically, the analysis was based on coastal and inland sites, which are the only two types of sites available in those parts of Florida. This analysis applies to the southwest part of Florida, although not so stated in the FES. The site analysis was

[12] See "Motion to * * * Compel Discovery", August 30, 1974, p. 4. The intervenors did not press any similar discovery requests against the staff.

[13] See "Order on Intervenor's Motion * * *", September 24, 1974, p. 3.

[14] See "Statement of Material Facts * * *", and the accompanying "Affidavit of C. D. Henderson Relating to Contention 1.6(b)".

[15] Staff response, September 17, 1974, pp.4-5.

[16] "Staff's Proposed Additions * * *", September 17, 1974, p.2.

based on all normal power plant siting criteria, as illustrated by Table 9.1 of the FES, and showed that construction at the St. Lucie site is more desirable than construction at any other site because of lower costs and comparable or lower environmental impacts.

The intervenors opposed summary disposition of their contention. In doing so, they pressed their claim (which the Board below had not yet passed upon, see p. 10, *supra*) that "the responses by the Applicant to their discovery attempts to ascertain alternative sites has been non-responsive, evasive and incomplete".[17]

In ruling on September 25, 1974 on the motions for summary disposition, the Licensing Board accepted the staff's supplemental statement of material facts relating to contention 1.6(b) and held simply that the intervenors' response was "not persuasive". Order, p. 4. On that basis, it granted the applicant's request and summarily dismissed the intervenors' alternative site contention.

4. The intervenors took the matter up with us on appeal.[18] In support of their claim that the Board below had erred in granting summary disposition of their contention, they made the following argument:[19]

> Originally Intervenors had planned to present their case on alternative sites through cross examination and discovery since only the ppplicant possessed this knowledge. But, Intervenors had difficulty with the Applicant in their effort to discover the number, locale, and identification of alterantive sites. The FES indicated the NRC Staff did not even know the identity of the single alternative site they list as having been considered in the FES Sec. 9.1.2 Table 9.1, which Intervenors regard as a serious omission by the Staff.

As noted at the outset of this opinion, we questioned staff counsel closely at the oral argument concerning the alternative site matter. After the argument, staff counsel made further inquiry into that subject and discovered the following information which was promptly passed on to us:

> * * * only one specific alternative site was considered in making the cost-benefit balance. That site is the one mentioned in the FES, Table 9.1. The exact identify of the site was unknown to the Staff at the time its cost-benefit balance was made because Applicant believed its location should not

[17] "Intervenor's Argument * * *", September 17, 1974 p. 1. More particularly, they there asserted: "In their response to interrogatories #61 of Intervenors, Applicant has designated the Flagler and Salerno Beach sites as the only alternative nuclear plant sites considered. Yet, when one reads the E.R. [sic; probably should be "FES"] for Unit 2 there is reference to an unidentified coastal site within 40 miles radius of West Palm Beach (which Intervenors suspect may be the one known as Riviera Beach site) and no mention of other alternative sites".

[18] The point was raised directly by exceptions 7 and 18. In briefing those exceptions, the intervenors also touched on other exceptions dealing with the question of alternatives.

[19] "Intervenors Briefs on Exceptions 2-45 * * *," p.10

> be disclosed for proprietary reasons. The information used by Staff in making its analysis was provided by the Applicant. The Staff considered no other alternative sites.
>
> The Staff used this approach because it believed that no alternative site could be found in this general service area which would be more cost beneficial. The reason for this apprach is that the primary site preparation work for St. Lucie Unit 2 was done simultaneously with the site preparation work done for St. Lucie Unit 1. Because this work had already been done and because of the already existing environmental impact of St. Lucie Unit 1, the Staff was of the opinion that no better alternative site could be found in this general service area.

October 20, 1975 letter from staff counsel to the members of this Board, pp. 1-2.[20]

Upon receipt of the staff letter, we called for a further explanation of the matters adverted to therein (see our order of October 23, 1975). In essence, we were seeking information as to precisely what steps the staff had followed in evaluating the alternatives to the St. Lucie site and where (if anywhere) that information was reflected in the record before the Licensing Board.

The staff's response was a lengthy one, consisting of a twelve-page affidavit (dated November 10, 1975) and an accompanying legal memorandum. The affidavit, like the one that had been submitted to the Licensing Board, was prepared by John R. Young. It would lengthen this opinion unduly to recite here extensive portions of the affidavit itself. Instead, we can draw upon the characterizations of it which the staff put forward in the accompanying memorandum.

In essence, the alternative site analysis was based on a "best possible case approach". That is, the staff examined no specific alternative site, not even the one referred to in the applicant's environmental report. Instead, the evaluation was based upon "a composite of characteristics which would typify the best alternative coastal site".[21] A similar procedure was followed in evaluating the

[20] Although the staff might not have been able at the time it prepared the FES to ascertain the metes and bounds of the alternative site, it does appear that it could have roughly approximated its location by using the information the applicant did give it. See fn. 10, *supra*; but see dessenting opinion, *infra*, fn. 6 and accompanying text.

[21] As the staff's earlier letter to us had disclosed, the reason for this was that the staff believed no alternative site could be found in the applicant's service area which would be more cost beneficial than the St. Lucie 2 site. This approach had been suggested by the applicant when, in commenting upon the staff's draft environmental statement, it urged that the staff emphasize in the FES the alleged "Overwhelming advantages" the St. Lucie site had over any alternative. See FES, pp. A46-A47. Although the staff papers now before us reveal that it perhaps did operate under that principle, the FES did not indicate that it did so (see pp. 839-840, *infra*).

alternative of an inland site.

The staff went on to claim that these procedures indeed were reflected in the record below. Specifically, it said that it had been Mr. Young's "intention" that pages 9-2 to 9-4 of the FES, as well as the affidavit he had submitted to the Licensing Board in support of the motion for summary judgment, were to have reflected "the total evaluating processes described in" the November 10, 1975 affidavit submitted to us.

After reviewing the staff's response, we asked all parties to brief us on its significance (see our order of November 28, 1975). In doing so, we posed a number of questions which we wished to have addressed. In substance, these questions were (1) whether NEPA permitted the use of the technique the staff said it had employed; (2) whether the record supported the staff's view that the characteristics it had put forward as representing the "best possible" hypothetical alternative site indeed accurately portrayed conditions in the regions under study; (3) whether the other parties had been given fair notice of the technique being utilized by the staff, "so that they could have the opportunity to challenge the underlying facts relied on or ultimate conclusions reached;" and (4) what remedy would be appropriate if we decided the Licensing Board's decision could not be affirmed.

Each of the parties duly filed responsive briefs with us. As part of its response, the staff submitted five more affidavits from the members of its site evaluation team (including another from Mr. Young, this one dated December 19, 1975) for the purpose of providing more information describing the nature of the technique they had used.

B. RESOLUTION

The staff may be justified in claiming that its method of alternative site evaluation comported with NEPA in principle, accurately assessed the facts in this case, and resulted in a valid conclusion. But the outpouring of facts and methodology in its post-argument affidavits has not yet been tested. Nor have the several affiants been required to defend against possible challenges to their approach. We therefore find it inappropriate to pass upon the merits of the staff's alternative site evaluation. All we can decide at this juncture is that the intervenors had no fair opportunity to contest the matter.

Our holding rests on an elementary ground: the staff's post-argument version of the procedure it followed is not fairly reflected in the record below, upon which the Licensing Board summarily disposed of the alternative site contention. Had that information been fairly presented to the Licensing Board, the intervenors' failure to respond substantively to the motion for summary

disposition (by way of countering affidavits disputing the effectiveness or accuracy of the staff's procedures or through some other method) might have justified the Licensing Board's summary handling of the alternative site contention. But the Board's rejection of this contention was premised on its unwitting acceptance of an incomplete—and to a marked degree misleading—explanation of what was involved.

We need not belabor the point. As our recitation makes clear (pp. 835, 836-837, *supra*), the discussion of alternative sites which the staff supplied to the Board was quite abbreviated. Its cursory and uninformative character stands out all the more when compared to the materials submitted recently. A fair examination of the record before the Board below does not disclose even in broad outline the manner in which the staff now says it proceeded. The post-argument papers reveal for the first time the "hypothetical site" approach the staff utilized in its alternative site evaluation. The differences are pervasive; the most obvious particular instance involves the staff reference in the FES to the "specific example used" in drawing a comparison between the St. Lucie site and "another coastal site". This manifestly indicates—contrary to fact—that the staff had reveiwed and rejected at least one other actual site on Florida's east coast.[21a] Approval may not be given to an FES which treats in such a cavalier and misleading fashion one of the most important questions which NEPA requires to be considered.[22] The intervenors' contention challenging the staff's action in this area should have been allowed to stand until the staff was able, either by way of uncontroverted affidavits or at a hearing, to explain precisely what it did and to establish that its approach was legitimate.

In short, we are compelled to the conclusion that neither the FES nor any other relevant documents filed with the Board below set out the process that the staff had followed with anything approaching sufficient clarity to permit the result the staff advocated to be put summarily beyond challenge.[23] Only after a full explanation was forthcoming could the intervenors be held accountable for failing to counter a motion for summary disposition of this issue.

We therefore have no choice but to reinstate the alternative-site contention

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[21a] Indeed, the staff told the Board it had evaluated sites "throughout the southern and eastern parts of Florida" (see p. 836, *supra*).

[22] The nature of the treatment the FES gave to the question of alternative sites stands in marked contrast to the specificity and attention to detail employed, for example, in its discussion of the terrestial and aquatic biota found in the region. See FES pp. 2-25, 2-27, and 2-28–2-34. We remain puzzled, as we have expressed ourselves to be in the past, by the tendency of the authors of environmental statements to pay excessive attention to minutiae while glossing over the most important subjects.

[23] As noted above (p. 839, *supra*), Mr. Young expressed the view that it was his "intention" that the materials before the Licensing Board "reflect the total evaluating processes" now put forward. That intention was not effectuated.

and call for whatever further proceedings are necessary to resolve that contention on its merits, either by summary process (if the facts the staff has put forward remain uncontroverted) or after a hearing. In either case, the parties shall brief—and the Board below decide—whether the staff's technique satisfied NEPA.[24]

Notwithstanding that the parties have asked us to do so, there exists no reason why we should conduct such additional proceedings ourselves. In any event, the congestion of our own docket precludes us from taking on such an assignment. Accordingly, we decline the staff's and applicant's invitations to pre-empt the Licensing Board's role. Instead, following the ordinary course, we are remanding the matter to the Licensing Board for its consideration. It goes without saying that the intervenors are entitled to participate fully in any proceedings to resolve the issues involved, and that it is for the Board below to determine what procedures are appropriate.

III. INTERVENORS' OTHER EXCEPTIONS

We have considered all the other exceptions briefed by the intervenors and have found nothing in them which would cause us to disturb the Licensing Board's decision. In nearly all instances, the reasons that Board gave for taking the challenged action are adequate in themselves to demonstrate that there is no substance to the points raised by the intervenors.[25] Nothing would be added

[24] In this connection, we might note that there is no substance to the staff's argument that the court of appeals which reviewed the Commission's *McGuire* decisions "found that the AEC's consideration of the alternative sites" in that case, which the staff claims to have involved "fundamentally the same" siting evaluation technique as used here, was "within the scope of the reasonableness test * * *". See NRC Staff Response, December 19, 1975, p. 7. A reading of the court's decision reveals that the question of alternative *sites* was neither in issue before it nor addressed by it. *Carolina Environmental Study Group* v. *United States*, 510 F.2d 796, 800-01 (D.C. Cir. 1975).

[25] We do note that in several instances the rulings under attack were compelled by principles embodied either in Commission regulations or in Commission or Appeal Board precedent.

One such instance involved the intervenors' attack upon the Price-Anderson Act. Such a challenge may not be heard in this forum. Before us, the intervenors attempt to avoid the force of this principle by arguing (although it is not fairly encompassed within the contention put forward below) that the impact of the Act's limitation of liability should at least be considered in the NEPA cost-benefit balance. But that balance already takes into account the consequences of a major accident, as discounted by the low probability of such an occurrence. Particularly in light of that low probability, the additional fact that victims might not be fully compensated—*i.e.*, that the loss would not be redistributed among all members of society—does not alter the balance significantly.

Another instance of a forbidden claim involved the intervenors' amalgamated "financial

(Footnote continued on next page)

were we to rephrase what the Board below said.[26]

IV. INTERIM RELIEF

The question remains as to the status of the outstanding LWA. For now, we are leaving it in effect. The St. Lucie site is not a virgin one; as the Licensing Board found, "little additional site preparation" is involved in adding a second unit[27] and thus little consequential environmental damage would occur if the limited work thus far authorized were permitted to go forward while the open questions are being resolved. In this circumstance, we find it appropriate to leave the limited work authorization in effect while the Board below undertakes the additional proceedings which are required. See *Southern California Edison Co.* (San Onofre Units 2 and 3), ALAB-212, 7 AEC 986, 996-97 (1974). As we said there, however, if "at any stage of the proceedings on remand, the Licensing Board receives evidence which suggests that the public interest would be best served by an interim suspension * * *, it is fully authorized to order such relief." *Id.* at 997.

As we mentioned earlier, the Board below thus far has passed only upon the questions related to the LWA; it still has before it the applicant's request for a construction permit. Although the remand which we have directed does not deprive that Board of the freedom first to decide those matters which are otherwise before it, the Board is directed not to authorize the issuance of any construction permit until it has passed upon the matter which is the subject of the remand. The action the Board then takes, both in terms of the existing LWA and the requested construction permit, will depend upon how it resolves all the questions now before it.

(Footnote continued from previous page)

qualifications—waste disposal" contention, which the Board below refused to entertain. As the Commission's regulations required it to do, the Board did take into account the environmental costs of waste storage. 1 NRC at 154, ¶120. And the financial cost of the plant reflects the fee to be charged by the government for such storage. The intervenors did not claim that the applicant was likely to be financially incapable of paying that fee. Rather, they claimed that the government should not perform that service at all. Because that claim was beyond the Board's jurisdiction to consider, no purpose could have been served by hearing the related assertion that the applicant might lack the financial wherewithal to undertake permanent waste storage itself.

[26] One matter which the Board below had no occasion to consider deserves brief mention. The intervenors' exception 45 urges us to rule that certain documents relating to water quality matters should not have been admitted into evidence. While that claim is not well-taken in any event, their failure to object below bars their raising the claim before us. (The only objection they did make had to do with the relationship of other phases of the proceeding to the timing of the introduction of the documents. See Tr. 3300-06).

[27] 1 NRC at 155, ¶124.

V. THE APPLICANT'S EXCEPTION

The applicant has appealed from the Licensing Board's imposition of a requirement that it connect the nuclear plant to municipal sewage treatment facilities "as soon as a sewer line on Hutchinson Island is brought within approximately five miles of the plant".[28] The applicant had earlier committed itself to such a connection when a sewer line reached the site. Its objection, then, goes to the Board's requirement that it do so when the sewer line is still five miles distant.

Neither in its initial decision nor in its opinion on reconsideration did the Licensing Board make clear precisely what motivated it to include the "five mile" condition. And our search of the record has revealed nothing which would lend support to such a requirement. Ordinarily, then, we might simply grant the applicant's exception and reverse the Licensing Board outright. But, as noted above, this proceeding must go back to the Licensing Board for other purposes. Since it is possible that the Board had sufficient (albeit unstated) reasons for imposing the condition, we perceive no harm in giving it the latitude to consider the matter anew, giving each party such opportunity to be heard as is appropriate in the circumstances. Accordingly, we vacate the "five mile" condition but leave it open to the Licensing Board to reinstate that condition, so long as it articulates its reasons for doing so. We will then be able to determine, if any subsequent appeal is taken, whether those reasons find support in the record.

VI. CONCLUSION

For the reasons stated above, the partial initial decision is *affirmed in part* and *reversed in part* and the matter is *remanded* to the Licensing Board for further proceedings not inconsistent with this opinion.

It is so ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING APPEAL BOARD

Margaret E. Du Flo
Secretary to the Appeal Board

[28] Partial Initial Decision, par. 105, 1 NRC at 147, as reconsidered, 1 NRC at 465-66.

Mr. Salzman, dissenting:

In a nutshell, the Final Environmental Statement for this plant represents that applicant's proposed St. Lucie site had been "compared to another coastal site" by the staff and that *"the specific example used* was located within a 40 mile radius of West Palm Beach," but not otherwise identified. F.E.S. §9.1.2. at p. 9-2 (emphasis supplied). Intervenors' contention that alternative sites had in fact not been properly considered was thereafter summarily dismissed by the Board below in express reliance upon that F.E.S. representation.[1] Limited work authorizations were later granted to the applicant.

When asked at oral argument on appeal to identify the "specific example" of an alternative site referred to in the F.E.S., staff counsel could not do so.[2] This inability was eventually cleared up post-argument, when the staff acknowledged on November 10, 1975, that it had never used any "specific example" of an actual alternate site for comparison purposes.[3] Rather, it disclosed that a completely different procedure had been followed, one which did not compare the St. Lucie site to other points in Florida at all, but rather made that "comparison" with "composite"–*i.e.*, hypothetical–sites.[4] As the majority's opinion renders all too clear, the staff's use of this interesting technique had never been revealed to the Licensing Board–much less to intervenors.

Moreover, the applicant actually did evaluate other property on the Florida east coast as a possible substitute for the St. Lucie site, but withheld the specific location of that alternative from the staff. The latter did not press for its disclosure, although admittedly "the exact identity of the site was unknown to the staff at the time its cost-benefit balance was made."[5] Papers filed with us post-

[1] This is confirmed by paragraphs 5 and 116 of the Licensing Board's initial decision, 1 NRC at 103 and 152, fn. 349.

[2] See pp. 837-838, *supra*.

[3] See pp. 838-839, *supra*.

[4] "The geographical locations used for the site analyses were general locations rather than locations which could be identified by coordinates on a map." Affidavit of Mr. John R. Young, dated November 10, 1975, p. 2, appended to the "NRC Staff's Response, etc., Concerning Site Selections," dated November 14, 1975.

[5] Staff Counsel's letter to Appeal Board dated October 20, 1975. See pp. 837-838, *supra*.

[6] Affidavits attached to the applicant's Supplemental Memorandum of December 19, 1975 reveal that applicant's alternative site was on the Florida mainland, about a mile and a half south of Jupiter Inlet which is at the southern end of Jupiter Island. On the basis of maps and affidavits supplied by the staff, it seems that the staff assumed the applicant's alternate site to have been on Jupiter Island itself, toward its northern end. The distance between those points is roughly comparable to that between Alexandria, Virginia and Bethesda, Maryland. The applicant's suggestion (Supplemental Memorandum, p. 11) that the "few miles' difference between the two sites is insignificant," does not tell the whole story. Among other things, a facility on Jupiter Island itself might intrude not only on a state park, but on extensive residential and resort developments, unfavorable characteristics not shared by the alternative site on the mainland actually considered by the applicant.

argument reveal that, as a result, until recently the staff appears to have labored under the misconception that applicant's alternate site was a dozen miles up the Florida coast from its actual situation.[6]

None of the foregoing is disputed. The National Environmental Policy Act requires the staff to consider possible alternative locations before approving any plant site,[7] and this Commission's regulations make the issuance of a limited work authorization hinge on the proper completion of that NEPA review.[8] My colleagues agree that neither NEPA's mandates nor the Commission's regulations could be satisfied by "an FES which treats in such a cavalier and misleading fashion one of the most important questions NEPA requires to be considered;" and are ordering the cause remanded for further proceedings because "the intervenors have had no fair opportunity to contest the matter." *Supra*, pp. 839-840. Nonetheless, though grounded on that unfair hearing, the majority allows the limited work authorizations sanctioned by the Board below to stand. That we possess authority to leave an LWA undisturbed while ordering a remand I readily agree;[9] whether equity calls for our exercise of that discretion in the exigencies of this case is another matter entirely.[10]

The record makes it embarrassingly clear that the staff failed to provide the Licensing Board with that "detailed and careful analysis" of alternatives to the St. Lucie site which the law requires. *National Resources Defense Council* v. *Callaway*, 524 F.2d 79, 92 (2nd Cir. 1975). The information withheld by the staff was an essential part of what the courts have characterized as the very "linchpin of the environmental impact statement." *Ibid.* Yet the issue of putting the St. Lucie plant on some alternate site was fairly and timely raised by the intervenors. It was summarily rejected only because the Board below was led astray by what my colleagues charitably call "an incomplete–and to a marked degree misleading–explanation" of what the staff had done in the way of examining those alternatives. *Supra*, p. 840. Because it deliberately kept the staff in ignorance of the actual location of its alternate site, the applicant cannot escape a measure of responsibility for the staff's failure to take the requisite

[7] *Northern Indiana Public Service Co.* (Bailly Generating Station, Nuclear-1), ALAB-22, 8 AEC 229, 265 (1974), *reversed, sub nom. Porter County Chapter* v. *AEC*, 515 F.2d 513 (7th Cir.), *reversed and remanded, sub nom. Northern Ind. Pub. Serv. Co.* v. *Walton League*, 423 U.S. 12 (1975), *affirmed, sub nom. Porter County Chapter* v. *AEC*, No. 74-1751 (7th Cir., Apr. 18, 1976).

[8] 10 C.F.R. §50.10(3)(1) and (2). See *Kansas Gas and Electric Company* (Wolf Creek Unit 1), ALAB-321, NRCI-76/4, 293 (1976), and ALAB-331, NRCI-76/6, 771 (June 8, 1976) (Commission review pending).

[9] *San Onofre*, ALAB-212, *supra*, and cases cited at 7 AEC 997.

[10] *See Wisconsin Electric Power Co.* (Point Beach, Unit 2), ALAB-82, 5 AEC 350, 351-52 (1972); *City of New York* v. *United States*, 337 F. Supp. 150, 163-64 (E.D.N.Y. 1972) (three-judge court).

"hard look" at that alternative.[11] Nevertheless, the applicant joined in–nay initiated–the motion for summary disposition of this issue.

Both parties thus bear responsibility for the circumstances which led the Board below improperly to dispose of the alternate site issue in their favor. And neither is in a position to complain that it would be "inequitable" for us to direct a return to the *status quo ante* by lifting the LWAs. I would do so. Whether we should take that action in this case hinges not on whether "little consequential environmental damage would occur if the limited work thus far authorized were permitted to go forward", as my colleagues seem to believe, p. 842, *supra*.[12] Rather, it turns on our obligation to preserve the integrity of the Commission's hearing procedures and its NEPA processes. We give cause to doubt the strength of our commitment where, when occasion arises to implement those policies, we speak–but do not act–forcefully. I therefore respectfully note my dissent.

[11] See *Kleppe* v. *Sierra Club* _____ U.S. _____ (Nos. 75-552 and 75-561, decided June 28, 1976, slip opinion p. 17, fn. 21).

[12] As this Board has ruled within the month, whether an applicant may engage in construction in advance of an LWA is contingent upon the work to be undertaken having "so trivial an impact that it can be safely said that no conceivable harm would have been done to any of the interests sought to be protected by NEPA should the eventual outcome of this proceeding be a denial of the * * * application." *Wolf Creek, supra*, ALAB-331, p.777. No such finding has been made in this case.

Cite as 5 NRC 1038 (1977) LBP-77-27

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Edward Luton, Chairman
David L. Hetrick
Frank F. Hooper

In the Matter of Docket No. 50-389

FLORIDA POWER & LIGHT COMPANY

(St. Lucie Nuclear Power Project,
Unit No. 2) April 19, 1977

Upon remand of partial initial decisions ordered by ALAB-335, 3 NRC 830, to reconsider the alternate site analysis, the Licensing Board finds that the NRC staff's prior site review was inadequate but that its new evaluation was satisfactory and that no site examined is superior to the proposed site. In addition, the Licensing Board issues its Initial Decision on radiological health and safety and other issues, making determinations of fact and law and authorizing issuance of a construction permit, subject to certain conditions.

NEPA: RULE OF REASON

The NEPA requirement to consider alternatives is subject to a "rule of reason." "What is required is information sufficient to permit a reasoned choice of alternatives so far as environmental effects are concerned." *Sierra Club* v. *Morton*, 510 F.2d 813 (5th Cir. 1975). The "rule of reason" approach includes the taking of such minimal steps as may be necessary to assure a real and practical factual knowledge of the matters to be evaluated.

TECHNICAL ISSUES DISCUSSED: Stalled hurricanes; projected occupational doses.

INITIAL DECISION

Appearances

Norman A. Coll, Esq., of Steel, Hector & Davis, and **Harold F. Reis, Esq.**, and **Michael A. Bauser, Esq.**, of Lowenstein, Newman, Reis and Axelrad, on behalf of the Applicant, Florida Power and Light Company

Martin H. Hodder, Esq., *pro se*, and on behalf of Rowena E. Roberts, *et. al.*, Intervenors

Daniel Lamke, Esq., on behalf of the U.S. Federal Power Commission

Edward G. Ketchen, Esq., and **William D. Patton, Esq.**, and **James R. Tourtellotte, Esq.**, on behalf of the Nuclear Regulatory Commission

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I. INTRODUCTION

1. Much of the history of this proceeding is set forth in the Partial Initial Decision on environmental and site suitability matters issued by the Board on February 28, 1975, *Florida Power and Light Co.* (St. Lucie Unit No. 2), LBP-75-5, 1 NRC 101 (1975) and the Supplement to the Partial Initial Decision issued by the Board on April 25, 1975, *Florida Power and Light Co.* (St. Lucie

Unit No. 2), LBP-75-25, 1 NRC 463 (1975). By those decisions, the Board made the environmental and site suitability determinations specified in 10 CFR §50.10(e)(3).

2. The results of the Staff's radiological health and safety review are set forth in the Safety Evaluation Report (SER), issued in November 1974, Supplement No. 1 to the SER issued on March 3, 1976, and Supplement No. 2 to the SER issued on April 27, 1976.[1] Pursuant to this Board's "Order Following Prehearing Conference" of April 29, 1976, hearings were held on radiological health and safety matters on May 20, 21, 25, 26, 1976. Subsequently, proposed findings of fact and conclusions of law were submitted by the parties on all of these issues. Before an Initial Decision covering these issues could be prepared, however, ALAB-335 was issued by the Appeal Board on June 29, 1976. The Appeal Board held that the Licensing Board was in error in summarily disposing of the Intervenors' contention with respect to the evaluation of alternate sites. In light of disclosures made by the Staff in the course of the proceedings before the Appeal Board, that body held that the Intervenors had not been informed of the essential ingredients of the Staff's alternate sites analysis and, therefore, had been deprived of a fair opportunity to contest the validity of the approach taken by the Staff. Accordingly, the alternate sites contention was reinstated and the matter remanded to the Licensing Board. The Appeal Board directed the parties to brief, and this Board to decide, whether the Staff's evaluation technique satisfied the National Environmental Policy Act. *Id.* at 840-41.

3. The Appeal Board determined not to withdraw the Limited Work Authorization that had been issued pursuant to the Partial Initial Decision. However, in an order entered on October 21, 1976, the United States Court of Appeals for the District of Columbia Circuit directed that the Limited Work Authorization be stayed pending resolution of the alternate sites matter. *Hodder v. NRC* (D.C. Cir. No. 76-1709).

4. Subsequent to the May 1976 hearings, the Regulatory Staff received extensions of time to make further inquiries into whether the emergency core cooling system (ECCS) for the proposed unit complies with regulatory requirements. As set forth in greater detail below, the evaluation model for the ECCS was subsequently required to be modified by the Staff. Accordingly, by motion dated August 12, 1976, the Staff moved to reopen the record to receive additional evidence concerning the adequacy of the ECCS, and, by order dated August 12, 1976, that motion was granted. An order issued August 23, 1976, provided that evidence would be received on the ECCS issue and on any issues

[1] The SER was admitted as a Staff Exhibit (Tr. 3344). However, no exhibit number was assigned. SER Supplement No. 1 is Staff Exhibit S-4 and SER Supplement No. 2 is Staff Exhibit S-5 (Tr. 3600). To avoid confusion, the SER is hereafter cited as "SER, p. ___" and the supplements are cited as "SER Supp. No. ___, p. ___."

presented by Intervenors' July 28, 1976, "Motion to Reconsider Contention 1.3 Need for Power and Conservation of Energy," should that motion be granted. The Board later reopened the record for reconsideration of Contention 1.3 as that contention was restated in the Board's Order of October 28, 1976. On November 11, 1976, the NRC issued its Supplemental General Statement of Policy (41 *Fed. Reg.* 4998) relating to the environmental effects of the fuel cycle. Although the fuel cycle issued had been dealt with in the Partial Initial Decision (para. 120), the Supplemental General Statement of Policy required the receipt of further evidence with respect to that matter.

5. Hearings were held on December 1, 2, 3, 4, 15, 16, 17, 1976, on the alternate sites, ECCS and need for power issues, and on January 11, 1977, on the fuel cycle issue. This Initial Decision addresses all the outstanding issues in this proceeding.

II. EVALUATION OF ALTERNATE PLANT SITES

6. One of the contentions which the Licensing Board originally permitted the Intervenors to place in controversy was the following:

> Whether the Staff's Final Environmental Statement has sufficiently considered alternatives to the proposed action including . . . alternate sites especially sparsely populated areas such as southwest Florida. Intervenors' Contention 1.6(b).

he Applicant moved for summary disposition of this contention, claiming that ternate sites were adequately considered in the FES. The Staff supported the otion, asserting that the FES reflects "consideration of alternative sites which clude any in southwest Florida, although the FES does not so state." The FES ats the alternate sites question in the following manner:

> A comparison of the St. Lucie site to another coastal site is presented in Table 9.1. This alternate site can be defined as a typical east coast site, although the specific example used was located within a 40-mile radius of West Palm Beach. (FES Section 9.1.2)

e Licensing Board summarily disposed of Intervenors' Contention 1.6(b) ely upon the above quoted representation that a specific alternate site had n compared to the St. Lucie site. It is now clear that, contrary to this resentation, the Staff had evaluated no "specific" alternate site when it pubed its Final Environmental Statement. What the Staff had done, we are told, to engage in a process of site evaluation which made comparisons of the St. ie site to any other specific alternate site quite unnecessary. The principal f witness on the subject now characterizes the use of the word "specific" in quoted FES Section 9.1.2 as "unfortunate" (Tr. 5796).

7. Upon receiving a detailed description of the procedure followed by the Staff in its alternate sites evaluation the Appeal Board, by ALAB-335, June 29, 1976, reinstated Contention 1.6(b) and remanded the matter to the Licensing Board. The Appeal Board observed that:

> The Staff may be justified in claiming that its method of alternative site evaluation comported with NEPA in principle, accurately assessed the facts in this case, and resulted in a valid conclusion. But the outpouring of facts and methodology in its postargument affidavits has not yet been tested. Nor have the several affiants been required to defend against possible challenges to their approach. We therefore find it inappropriate to pass upon the merits of the staff's alternative site evaluation. All we can decide at this juncture is that the intervenors had no fair opportunity to contest the matter.

Following the remand, in August 1976 the Regulatory Staff performed another alternate sites evaluation in this case. This second effort differed considerably in method from the first evaluation. Each of these evaluations is described and discussed below.

8. We begin with an examination of the alternate sites analysis performed by the Staff in the year 1973, prior to preparation of its FES. The methodology employed at that time is characterized by the Staff's principal witness on this aspect of the case as a "best characteristics" or "best regional" site evaluation methodology. Young affidavit, November 1976, p. 5. The evaluation consisted of a kind of comparison between certain actual characteristics of the proposed St. Lucie Unit No. 2 site to what are claimed to be "the best possible characteristics" of other possible sites where the plant might be located. The conclusion reached was that none of the other possible sites possessed better characteristics for the siting of the plant than the proposed St. Lucie Unit No. 2 site on Hutchinson Island. None of this is to say, however, that the Staff evaluators actually visited, or even specifically defined, any possible alternate site. Instead, the evaluators viewed the entire State of Florida as having been divided into five so-called "general siting regions." They then quickly eliminated three of these "general siting regions" from further consideration because of what were determined to be higher economic costs, greater ecological impacts, lower transmission reliability, or greater nearby population concentrations—all as compared to the proposed St. Lucie Unit No. 2 site at Hutchinson Island. The two remaining regions were then divided into fourteen smaller regions, six of which were eliminated because of "excessive population" or "longer transmission distances." The same process of elimination was continued until but three possibilities were left: one specific site (the proposed St. Lucie Unit No. 2 site at Hutchinson Island), one generalized coastal region (somewhere on or around Jupiter Island), and one generalized inland region (somewhere near Lake Okeechobee). Young affidavit, November 10, 1976, p.6.

9. It is said that an "important principle" underlying this site evaluation methodology is that of "obvious conclusion"—meaning simply "that an alternative should be excluded if it has an obvious overwhelming disadvantage . . .or conversely, an alternative is the best if it has an overwhelming advantage . . . . which cannot be offset by any conceivable combination of advantages for other alternatives." Young affidavit, December 19,1975, p.2. Thus it was that certain specific characteristics of the proposed St. Lucie Unit No. 2 site were compared to what the evaluators deemed to be the best possible (not actual) characteristics of the two remaining regions. Absent any visit to a specific site within either of those two regions, or even an identification of any specific alternate site within either of those two regions, the judgment about the "best possible characteristics" of any specific site within those regions was derived upon the basis of a general familiarity with certain portions of the State of Florida. In this regard, the principal Staff witness on this subject testified as follows:

> In preparation for this evaluation the environmental reports for both the St. Lucie 1 and 2 power plants, the FES for St. Lucie 1, and appropriate descriptive material for southern Florida were studied. In addition, the general characteristics of southern Florida were obtained by discussions with former residents employed by Battelle. Numerous power plant siting documents . . . were reviewed to assure familiarity with all siting requirements. I also had prior knowledge of the general characteristics of Florida from a one-week vacation trip in 1969 when I drove the full length of the east coast and much of the west coast. Young affidavit, November 1976, p. 4.

he proposed St. Lucie Unit No. 2 site was determined to be superior to all thers, since that site had "equal or better characteristics than the characteristics or the best possible location in" either of the remaining two regions. Young fidavit, November 10, 1975, p. 7.

10. It is true, as both the Applicant and the Staff argue, that the National nvironmental Policy Act is silent concerning the particular manner in which ternate sites are to be compared. As a result, the requirement to consider ternatives is indeed subject to a "rule of reason." Both Applicant and Staff ace particular reliance upon *Sierra Club* v. *Morton*, 510 F.2d 813 (1975) "What is required is information sufficient to permit a reasoned choice of ternatives so far as environmental effects are concerned"), and *Northern Indiana Public Service Company* (Bailly Generating Station, Nuclear Unit 1), LAB-224,8 AEC 244 (August 29, 1974). In Bailly, *supra*, a number of potenal sites were initially considered but only two, deemed to be the two best sites, ere subjected to a detailed comparison. But the instance that we are presently nsidering is one in which no two specific sites received any such comparison. o party has cited to us any case holding that the NEPA requirement to mpare alternate sites is satisfied without an actual comparison of two or more

real, specifically identified sites. Nor have we found such a case. The Applicant and Staff insist nevertheless that what was done in this case, as heretofore described, was "reasonable" and therefore, comported fully with the requirements of NEPA. We reject that conclusion. In our view, the alternate sites comparison performed by the Staff in preparation of its FES was, in the circumstances of this case, unreasonable and fell short of what NEPA requires.

11. The Applicant argues, at page 2 of its Reply Brief on the alternate sites question, that, "Under the rule of reason there is no requirement that individual sites be analyzed" and that, "In order to generate sufficient information, the responsible Federal agency need not compile mass studies for each alternative," citing *Cape Henry Bird Club* v. *Laird*, 359 F. Supp. 404, *aff'd* 484 F.2d 453. The Regulatory Staff makes the same points in its brief on this question.

12. The "rule of reason" does not *preclude* in any fashion analysis of specific alternate sites as part of a NEPA evaluation. No party makes any suggestion to the contrary. A comparison of specific sites seems to be the usual way in which the Staff makes its alternate sites evaluation in reactor licensing cases (Tr. 5580; 5760-61). Nor can it reasonably be denied that the "rule of reason" in a given case may, dependent upon the particular circumstances, demand that specific alternate sites in fact be analyzed. Additionally, the argument that NEPA does not require the compilation of "mass studies" for each alternative considered is of no real relevance on the question we are now considering. Indeed, if the measure of the sufficiency of the Staff's first alternate sites evaluation in this case is to be the "massiveness" of the studies made or the data produced, we would find it quite difficult to label that effort "inadequate." We think, however, that "mass" is not the proper measure.

13. A "reasonable" evaluation of alternate sites has to depend upon all of the circumstances in which that evaluation is made. In our view, the reasonableness of the evaluation, in terms of NEPA, does not depend upon the ultimate conclusion reached. We do not understand NEPA to require a particular result. We have no doubt, however, that NEPA's "rule of reason" contemplates the taking of such minimal steps as may be necessary to assure a real and practical factual knowledge of the matters to be evaluated. And these "minimal steps" consist of the evaluators doing *all* of that directed to those ends which, at least, can readily and easily be accomplished in the circumstances in which they work. We are not able to conclude that the elaborately constructed alternate sites evaluation "methodology" employed by the Staff met that standard. Actual inspection of particular alternate sites could readily and easily have been performed by the Staff and was called for in the circumstances of this case.

14. The opportunity to carefully and realistically assess possible alternate sites was available to the Staff. Indeed, the Staff started out seeking specific information about particular alternate sites as early as May 1973. Its reasons for not following through in that regard are trivial at best and inexcusable in the

circumstances. The evidence indicates that three requests were made upon the Applicant for the locations and other information about possible alternate sites between May and October 1973. Adequate responses were never forthcoming (Tr. 5780-84). The Staff had reason to believe at the time that Applicant's unwillingness to respond adequately was due to Applicant's "proprietary" concerns (Tr. 5743-44). In September 1973, Staff representatives actually visited the proposed site at Hutchinson Island, but visited no other one; as set out below, the Staff was at this time actually aware of at least two possible alternate sites. Still, and in the face of earlier inadequate responses to requests for additional site information, the Staff nevertheless declined to actually look at any alternate sites. In October 1973, the Staff made its last request to the Applicant for specific information concerning specific alternate sites. Then, also in October 1973, the Staff decided that, while descriptions of specific sites might be "useful" (Tr. 5785 *et seq.*), such was not really necessary because enough information was by then available to enable the performance of a "best regional characteristics" analysis (Tr. 5814), and because the principal Staff evaluator had a deadline to meet (Tr. 6629-30). Thus, the analysis was performed and the FES was issued in May 1974.

15. Employment of the evaluation "methodology" wholly failed to reveal significant facts which actual site visits would undoubtedly have revealed. Common experience overwhelmingly suggests that one cannot truly know the physical characteristics of a particular *site* without at least some study of that particular *site* (not a generalized "region" containing many sites). The point is forcefully made by what actually happened here. Two sites, Martin and South Dade, were identified by the Applicant in its Environmental Report and were thus known to the Regulatory Staff. The identification, in amendment No. 2 of the Environmental Report (November 6, 1973), was as follows:

> Florida Power and Light Company is presently developing two inland sites in southern Florida that are suitable for either fossil or nuclear generation. These include the Martin site located in Martin County approximately 50 miles west of West Palm Beach and the South Dade site located in Dade County south of the Turkey Point plant. The Martin site is a cooling pond site and the South Dade site may be either cooling pond or cooling tower site. Two 800-850 Mwe oil fossil units are scheduled to be installed in the period 1977 and 1980 at each of these sites.

Earlier, in conversations with representatives of the Applicant in September 1973, during the Staff's visit to the proposed Hutchinson Island site, these sites were mentioned to the Staff evaluators. Nevertheless, the Staff's "regional analysis" of the region in which the Martin site is located wholly failed to disclose the fact that the Martin site was then being developed as a cooling pond site which will ultimately have a cooling pond reservoir of some 7000 acres. Thus, this

prospect was not taken into account as one of the best regional characteristics. Consequently, the region and, presumably, all potential sites within it, were found to have "questionable" cooling water availability, and "difficult" liquid waste disposal possibilities, when first compared to the proposed St. Lucie Unit No. 2 site on Hutchinson Island. Later analysis, including an actual visit by the Staff evaluators to the Martin site, revealed the availability of both "good" cooling water and "good" waste disposal facilities (Young, Supplemental Testimony, November 1976, following Tr. 5443, Table 2, p. 19).

16. The alternate sites evaluation methodology employed here is troublesome in other ways as well. The Staff argues that the "method of site evaluation [is] based on a standard alternative analysis technique, commonly used by decision makers . . ." However, with respect to this "commonly used" methodology, the principal Staff witness on this subject testified that in only two instances involving power plant siting has employment of this methodology resulted in the discarding of all possible alternate sites without the evaluators having had a particularized description of those sites or even knowing where they were. As it happens, those instances were (a) the evaluation of the St. Lucie Unit No. 1 site, and (b) the evaluation of the proposed St. Lucie Unit No. 2 site, both at Hutchinson Island, Florida (Tr. 5585 *et seq.*) The witness could only venture a guess about why St. Lucie and Hutchinson Island seem to be unique in this regard: he opined that other site evaluators examining potential sites at other places were probably not aware of this "commonly used" methodology, so they carried on their analyses (perhaps unnecessarily) to the point of comparing specific sites (Tr. 5586 *et seq.*). Then, despite the witness' own insistence that the technique employed is "standard," "normal," and in "common use," the witness expressed concern that where a conclusion is drawn without there having been a comparison of specific sites, the Staff "might have the type trouble we are having in this hearing here, that people have a little difficulty understanding the methodology if we don't go into the final steps of looking at specific sites even though it was really not necessary" (Tr. 5786); and, "if we wrote an environmental statement and we have never visited the site, I am sure the environmental statement would be challenged on the basis that we did not have sufficient knowledge of that site. But as a general rule, many of these site visits are almost window dressing" (Tr. 5613).

17. Finally with regard to this "standard," "commonly used" methodology, we are told that it has been developed over the centuries by "hundreds of people," and amounts to little more than "elaboration upon the obvious":

> If I were buying an automobile and, let us assume I have seven members in my family, the sooner I discover that the Volkswagen Beetle will only hold five people, I look no further at the Volkswagen Beetle; it is the same type of reasoning. (Tr. 5792;5846)

We believe that NEPA demanded more. Upon consideration of all the evidence in this regard, we conclude that the alternate sites analysis performed by the Staff in the year 1973 and reflected in its FES did not, in the circumstances of this case, constitute reasonable compliance with the requirements of the National Environmental Policy Act.

18. As stated above, the Staff performed another site evaluation in this case in August 1976, a time subsequent to the Appeal Board's remand of the matter to the Licensing Board. This analysis was assertedly performed with the following objectives in view:

(1) "to determine whether a better site could be identified due to any change in circumstances since the previous analysis conducted" by the Staff in preparation of the FES, and

(2) "to determine whether the previous analysis was still valid and still shows that the Hutchinson Island site is still the best available alternative location of St. Lucie Unit No. 2," Young affidavit, November 1976, pp. 1-2.

This time, actual visits to several specific sites were made by the Staff evaluators. Particularly, the propsed site at Hutchinson Island, and sites known as DeSoto, South Dade, Martin, Salerno, and Juno Beach were inspected on August 17-18, 1976, by aerial survey, onsite examination, or both. The available technical literature concerning each of these places was reviewed and characteristics of each of the sites were discussed with the Applicant's personnel. A detailed comparison of the proposed St. Lucie No. 2 site to each of the other sites investigated is contained in Table 2, Testimony of J. R. Young, November 1976, pp. 19-21 (following Tr. 5443). Staff witnesses have given testimony about each of the sites as viewed from the witness' own field of expertise. This testimony covers terrestrial and aquatic ecology and hydrology (Testimony of Frank P. Hungate, Site Alternative Analysis Update; Testimony of NRC Regulatory Staff by Duane H. Fickheisen; Testimony of Robert G. Baca on Hydrological Aspects of Alternative Site Analysis Update; following Tr. 5443).

19. Intervenors have pressed the position that St. Lucie Unit No. 2 should not be constructed at the site on Hutchinson Island, but, rather, should be constructed at the Martin site. Intervenors' principal witness on alternative sites was Dr. Karl Z. Morgan (Testimony Recommending the Location of St. Lucie No. 2 at a More Suitable Site Than Hutchinson Island by Karl Z. Morgan, following Tr. 6192). Dr. Morgan testified that the site on Hutchinson Island has many undesirable features. He listed the following: (1) the density of the population and the prospect of a rather rapid increase in neighboring populations over the operating lifetime of the plant; (2) difficulties of egress and safe evacuation in time of emergency; (3) shipment of fuel to and from St. Lucie 2 by truck instead of rail; (4) the lack of holdup of cooling water before discharge and the

insufficient capacity to hold up intermediate high level liquid discharges; (5) the doubling of population exposures resulting from adding St. Lucie 2 to a site already containing one nuclear reactor; and (6) the likelihood of common mode failures where two units are operated by the same utility at a single site. Dr. Morgan concluded that there are other sites that avoid certain of these shortcomings, that the Martin County site would "score the highest" of these other sites, and that it would score better than the site on Hutchinson Island on each of the above enumerated features (Morgan, pp. 1-4, 6).

20. The evidence indicates that the population within a 50-mile radius of the Martin site is greater than that within a 50-mile radius of the proposed St. Lucie Unit No. 2 site (Young, November 19, 1976, p. 19). With respect to radiation doses, dose exposure in the year 2020 resulting from the operation of St. Lucie Unit No. 2—other than exposure to plant workers and an exposure due to transportation—is 4 person rem per year within a 50-mile radius assuming a population of 1 .000 people (see testimony of Dr. Roger Linnemann, p. 2, following Tr.). In individual terms, this amount to an average dose of .002 millirem per p /per year. *Id.* From a medical standpoint, both the cumulative and individual dose commitments are medically insignificant and would have no detectable impact. *Id.*

21. Applicant's witness Dr. Linnemann testified that even if the expected population surrounding St. Lucie 2 in the year 2020 lived at the fencepost of the reactor site, there would be no detectable medical impact resulting from the radiation dose (.5 millirem) expected to be received at that location (Tr. 6227-6228). There would not be an observable increase in the number of cancers around the St. Lucie plant or around a similar plant with a lesser population at any time during the lifetime of the plant (Tr. 4881). With respect to genetic effects in a larger population, Dr. Linnemann testified that 99% of the risk of genetic harm comes from exposure to workers in the plant and that he would not expect to observe any genetic harm as a result of the radiation exposure to these workers or to the public as a result of the plant (Tr. 4884-4886). In short, the environmental cost-benefit analysis is not materially affected by the differential in radiation dose exposure resulting from moving the plant (Linnemann, p. 3).

22. The evacuation requirements for St. Lucie 2 have previously been approved by this Board and by the Appeal Board (ALAB-335, 3 NRC at 834, Partial Initial Decision, paragraphs 63, 87). Dr. Morgan did not base his comparison of the Martin and St. Lucie sites on any specific calculations of the time required to evacuate at Martin. Rather, his conclusion was based on his general knowledge of the area and his experience in other situations (Tr. 6470-71). Witness Young disagreed with Dr. Morgan. In his view, evacuation problems at Martin would be at least as great as at Hutchinson Island (Tr. 6374-75). The evacuation cost-benefit comparison of alternatives to the proposed site is not a

significant factor in the overall cost-benefit determination in any event (Tr. 6372-73).

23. Shipment of spent fuel by truck instead of rail would result in a one-tenth reduction in dose exposure. The average dose exposure to an individual from transportation by truck is .006 millirem. By rail, it would drop to .0006 millirem (Tr. 6242). Dr. Linnemann testified that these dosages are medically insignificant (Tr. 4874, 6241). As a result, from a medical point of view, there can be no material cost-benefit differences in shipping by rail instead of by truck (Tr. 6241). The exposure from transportation of spent fuel is too small to be a factor in choosing any site (Tr. 4874).

24. With respect to liquid effluent discharges, there will be no "intermediate to high level liquid discharges" to the cooling water (Tr. 6378-79). But Dr. Morgan appeared to be concerned principally with the fact that effluents would be discharged into the ocean environment at St. Lucie whereas, presumably, at Martin, effluents would be discharged into the Applicant's cooling pond (Tr. 6475-6505-06). Staff witness Dr. Eckerman, called in rebuttal to Dr. Morgan, testified that the liquid effluent releases from St. Lucie 2 have been evaluated and found to be well within the design objectives of NRC regulations and there would be no undesirable concentrations of any liquid effluents in the environment (Tr. 6379).

25. It has already been determined that the location of St. Lucie 1 and 2 at the same place will meet the dose design requirements of 10 CFR Part 50, Appendix I (Tr. 6380). That dose would not figure significantly in the alternative site cost-benefit analysis. As for common mode failures for two-unit sites, we regard the Intervenors' testimony as being so lacking in detail as to cause us to be unable to discern its relevance to the alternate sites analysis.

26. The St. Lucie 1 reactor building and its appurtenant facilities cover nearly 300 acres of land (Pearson-Kent, pp. 2-3). The terrestrial impact of this complex cannot be disassociated from the construction of any other large power plant (*Id.*, p. 2). St. Lucie 2 would occupy only about 5 acres of this site (*Id.*). In addition, St. Lucie 2 would be able to share most or all of these appurtenant facilities with the existing St. Lucie Unit No. 1 (*Id.*, p. 3). These include access roads, laydown areas, warehouses, storage and administrative buildings, onsite electrical, water and waste disposal facilities, parking areas, a concrete batch plant, fuel storage facilities for construction equipment, and plant systems such as a cooling water intake system and an ultimate heat sink (*Id.*). Therefore, the environmental impact of St. Lucie 2 will necessarily be significantly less when compared to any other site (Hungate, pp. 2-3). Moreover, no additional commitments of land for transmission line corridors and no additional transmission line construction will be required for St. Lucie 2 at Hutchinson Island (Pearson-Kent, p. 3). While it is true there has been some environmental impact at Martin

due to the construction of two fossil units there, there are no facilities built other than access roads and some portion of a cooling pond reservoir (Tr. 5203).

27. There are also large economic advantages related to the cost of the shared facilities and cost of delay. To build St. Lucie 2 at any other site would require Applicant to construct, at a significant additional cost, facilities which St. Lucie 2 will be able to share because of the existence of St. Lucie 1 (Pearson-Kent, p. 4).

28. Moreover, it would add, at a minimum, four and one-half years to the 1983 construction completion date presently planned for St. Lucie 2 (*Id.*, pp. 4-6). No evidence has been presented indicating that further investigation is likely to disclose an alternate site so environmentally superior to Hutchinson Island to justify this delay. Indeed, the evidence shows that there is no reason to believe that there exists some better site, population and all other factors considered, than Hutchinson Island for St. Lucie 2 (Tr. 6000-6002).

29. In conclusion of this matter, we find that the alternate sites analysis performed by the Regulatory Staff in the year 1976 in this case, as described herein, gave adequate consideration to possible alternate sites. Pursuant to 10 CFR §51.52(b)(3), the Final Environmental Statement is modified to reflect our findings in this regard.

III. NEED FOR POWER

30. By a motion dated July 28, 1976, the Intervenors requested the Board to reopen the record to reconsider Contention 1.3, a contention which had already been decided in the Partial Initial Decision (Partial Initial Decision, para. 32-49). Original Contention 1.3 reads as follows:

> Whether sufficient need for power will exist to justify the present construction of the facility, particularly whether:
>
> (a) the projected reserve margin without the facility would be adequate;
> (b) conservation measures by consumers due to changes in the rate structure designed to reduce the demand for electricity including peak pricing and higher overall prices will eliminate or postpone the need for the facility;
> (c) whether or not there shall occur in the future a slowed rate of economic growth in Florida, which would reduce the need for power;
> (d) whether there are power pools for Applicant to join; and if so, by joining such pools, whether its reserve needs would be diminished sufficiently to eliminate the need for the facility;
> (e) conservation of electricity by Applicant's customers due to increased rates presently occuring.

31. On October 8, 1976, Intervenors filed "Intervenors' Second Supplement to the Motion to Reconsider Contention 1.3," and there stated the following:

> The Intervenors have never challenged the proposition that at some unspecified time in the future the additional base load generating capacity represented by St. Lucie Unit No. 2 would be needed. The question this Board must determine is, when is the earliest date that this plant must be built. That is the issue that must be addressed if fair consideration is to be given to utilization of possible alternative sites for St. Lucie Unit No. 2 . . . .

Therefore, it was not the Intervenors' purpose in seeking reconsideration to reopen all of Contention 1.3, nor to challenge the determination that at some future and specific time additional generating capacity would be required to meet demand. Rather, the question sought to be litigated was that of the time when power from the proposed facility will be needed, as that question may relate to the alternate sites matter that the Board was to consider upon remand.

32. Thus, by its Order dated October 28, 1976, the Board granted Intervenors' motion with Contention 1.3 modified to read as follows:

> Whether, in light of developments occurring since the issuance of the Partial Initial Decision in the case, sufficient need for power will exist to justify the construction schedule presently proposed by the Applicant; in particular, whether:
>
> (a) the projected reserve margin without the facility at the Hutchinson Island site would be adequate;
> (b) conservation measures by consumers due to higher overall prices will postpone the need for the facility; and
> (c) there shall occur in the future a slowed rate of economic growth in Florida, which would reduce the need for power.

33. The restated contention made it necessary for the Board to take into onsideration the economic changes which have occurred since issuance of the artial Initial Decision, and has thereby enabled us to decide the earliest date at hich the plant will be needed. This finding, in turn, enables the Board to etermine whether or not construction at an alternate site could be acomplished within this time constraint. The findings in this section, therefore, upplement and modify findings in the Partial Initial Decision with regard to the ed for power and the Applicant's construction schedule.

34. St. Lucie Unit No. 2 was originally scheduled for service in 1980. arious delays extended the earliest possible inservice date to late 1982 (Bivans, stimony after Tr. 4896). The Applicant presently plans to bring St. Lucie Unit . 2 into service by the summer of 1983 (Bivans, Exhibit 4, p. 2). Severe onomic recession and high inflation in Florida caused the Applicant to revise long-term peak load forecast (Sergel, pp. 2, 5; following Tr. 4894). In May

1974, June 1975, and December 1975, the Applicant successively revised downward its average long-term peak load forecast (Sergel, p. 5). In late 1976, the Applicant again revised its forecast utilizing the results of a more sophisticated economic model which combined the analysis of historical growth patterns with projections of several economic variables which could affect growth. These included an index of the economy, population growth, electricity prices, appliance saturation, and weather conditions (Sergel, p. 5). This latest peak load forecast predicted a range in annual growth from 4.4% to 6.1% for the 1975-85 period (Sergel, p. 10). This range approximates the range of growth rates being forecast for the nation as a whole (Sergel, p. 12). This forecast of growth rate in Florida was supported by the testimony of Staff Witness Uhler (Uhler, following Tr. 4997). His analysis concluded that considering the recession, inflation, and change in economic conditions in Florida which have occurred since 1975, the Applicant's projections of growth rate were reasonable and that a 1982-1983 in-service date for St. Lucie Unit No. 2 was both reasonable and prudent (Uhler, p. 11). The Board accepts the Applicant's range in average annual growth rate of 4.4% to 6.1% for the 1975-1985 period as being a reasonable projection which takes into account economic conditions and other important growth variables.

35. The Applicant calculated the system risk associated with the projected reserves using the "loss of load probability" technique utilized by most utilities and endorsed by the Federal Power Commission. From these calculations, it was concluded that the minimum acceptable reserve margin on its system is in the range of 15 to 20% (Bivans, pp. 19-20). Applicant's Witness Bivans gave schedules for construction of nuclear and coal-fired units under the above high and low projections of load growth (Bivans, pp. 18-21). Flexibility in construction schedule required to accommodate the high growth possibility will be made possible by accelerating the construction of the coal-fired units at the Martin site. Under high growth conditions, Martin Unit 1 could be brought on line in 1981 and Unit 2 in 1982; under low growth conditions, Unit 1 would be scheduled for 1982 and Unit 2 for 1984 (Bivans, p. 21).

36. In response to questions by the Board, Applicant's Witness Bivans testified that under the circumstances of low growth projections but with an accelerated construction schedule for Martin Units 1 and 2, the reserve margins in 1983 would be approximately 19%. This would be the last year that the utility could operate within the minimum acceptable reserve margins without St. Lucie Unit No. 2 (Tr. 5988-89). Cross-examination by the Intervenor revealed, however, that an additional 4% capacity would be available in 1983-85 if the utility retains old standby units presently scheduled for retirement (Tr. 4992). Adding this additional reserve to that projected for 1983, and considering that an accelerated schedule is feasible for the two Martin sites, the Board concludes that adequate reserves can be made available through 1983 without St. Lucie Unit No. 2; but, considering all information on available reserves and possible

construction schedules, the Board concludes that a base load plant approximately the size of St. Lucie Unit No. 2 must be constructed at the St. Lucie site or at an alternate site so as to be available in 1984.

37. Although the construction of a base load unit the size of St. Lucie Unit No. 2 could be delayed, it was clear from testimony of Witness Bivans that it was desirable to bring this unit on line as soon as possible (Tr. 4956) because of the economic advantage of nuclear plants vs. coal or oil-fired plants (Bivans, pp. 21-24). Staff Witness Gunderson concluded that St. Lucie Unit No. 2 should be completed as soon as possible because he considered the capacity from this unit as being essential for system reliability in 1983 (Gunderson, following Tr. 5003, p. 3).

38. The answers to questions addressed to Witness Bivans by the Board indicated that it might be possible to bring a nuclear unit on line at the Applicant's South Dade site by the end of 1985 (Tr. 4987). However, the Martin units cannot be considered substitutes for St. Lucie Unit No. 2 since all are needed additions to the system (Tr. 4954). Thus, considering the entire record on the need for power, the Board finds that the earliest projected date at which a unit the size of St. Lucie Unit No. 2 can be constructed at an alternate site is 1985. This would leave inadequate reserve margins even with low growth rate projections. The Board concludes that the Applicant's revised forecasts are reasonable and that the projected reserve margins without St. Lucie Unit No. 2 on Hutchinson Island would be inadequate. In addition the Board finds that the economic advantage of nuclear fuel, which is recognized in the Partial Initial Decision, (Partial Initial Decision, para. 49) is still valid (Bivans, pp. 21-24; Gunderson, pp. 4-5; Tr. 4946-4958; Tr. 4881, Tr. 4984-4985; Tr. 5043-5052).

IV. STALLED HURRICANES

39. In its Partial Initial Decision, the Board considered in some detail a hypothesized probable maximum hurricane (PMH) and the erosion it would create under high water conditions at maximum surge height (1 NRC at 122-124). However, the Board recognized that, although the maximum probable hurricane represented conditions of maximum hurricane intensity, the record was not clear as to the erosional damage in a situation of maximum hurricane durations at a maximum or relatively high level of intensity. The Board therefore directed the Applicant and Staff to submit evidence on the expected frequency of occurrence and the erosional damage to be expected from high intensity-long duration hurricanes (1 NRC at 466).

40. At the Staff's request, the Applicant: (1) reviewed historical hurricane data in the general region of the site and identified historical occurrences of hurricanes that had stalled, looped, or were slow moving, then (2) postulated storm conditions including surge and wave heights which could be associated

with a severe stalled or looping hurricane, and (3) evaluated the possible effects of such conditions at the plant site (SER supp. No. 1, p. 2-2).

41. From its analysis of the historical data on stalled hurricanes and looping hurricanes, the Staff concluded that hurricanes of this type did not intensify but that they deintensify gradually (Goodyear, Tr. 4428). Because deintensification is slow, because hurricanes of this type are a frequent occurrence in the area, and because the St. Lucie site was unprotected and erodible, the Staff concluded that stalled and looping hurricanes should be considered as a design-basis event for the St. Lucie site (SER Supp. No. 1, p. 2-5).

42. From its analysis the Staff postulated a stalled hurricane that would produce the worst possible combination of wave, water level, and erosion conditions at the site (Hullman, Tr. 4394). This hurricane was described as a maximum probable hurricane that stalls as it approaches the continental shelf, begins to deintensify, and drifts shoreward at a minimum translation speed of 1 knot (SER Supp. No. 1, p. 2-5).

43. Both the Applicant and the Staff postulated the parameters of this stalled hurricane (SER Supp. No. 1, Table 2-2). Very conservative assumptions were used by the Staff in its projection of these parameters. These were: (1) a 20% stall-induced reduction in pressure distribution, and (2) a translation speed of 1 knot during the hurricane's approach to the site (SER Supp. No. 1, p. 2-5). The Applicant presented calculations that showed a more realistic value for the reduction in pressure during deintensification is 60% (Applicant's Exhibit 26, pp. 6-7). The assumed translation speed of 1 knot was also conservative since it permits travel for a long period of time on a straight track towards the site, and thereby maximizes the erosional potential (Simpson, Tr. 4326-4327).

44. Although hurricanes that stall or slow down will normally deintensify (SER Supp. No. 1, pp. 2-4 to 2-5, Tr. 4264), Applicant's witness Simpson described meterological circumstances under which a hurricane can slow down and intensify at the same time. This occurs when a hurricane is caught between the influence of the trade wind zone and westerly wind currents in such a way that there is a rapid increase in the rate of movement of air through the storm. This brings about a drop in central pressure intensification (Simpson, Tr. 4272-4276). This set of circumstances is not uncommon in the portion of the Atlantic near the site and could be expected to occur in this area once every 2 or 3 years (Tr. 4379). This combination of a hurricane stall and intensification, however, cannot persist for more than 24 hours. Thereafter such a storm would move either southeast or westward with increasing speed and/or would deintensify (Simpson, Tr. 4279; Tr. 4280). The postulated stalled hurricane analyzed by the Applicant and Staff would create the longest possible period of erosion at the site (Tr. 4382) and because of this characteristic would be more damaging than the hurricane described by Witness Simpson which stalls and intensifies for a short period of time (Simpson, Tr. 4334; Tr. 4335).

45. Although the stalled hurricane postulated by the Staff would produce the worst possible erosion conditions at the site (Tr. 4336), the storm surge water level would be lower than the moving PMH previously analyzed by the Staff and Applicant, and presented in the PSAR and FES. The design basis flood level therefore is not changed by the stalled hurricane analysis (Tr. 4395, 4431).

46. Staff Witness Hullman testified that the flood protection at doorways specified in the FES would no longer be needed because structures would be erected in front of the doors to deflect waves and divert water (Tr. 4430-31). The Board accepts these findings and accordingly cancels the requirement made in paragraph 126d of its Partial Initial Decision concerning this matter.

47. The Applicant's analysis of erosion from stalled hurricanes took into account both littoral drift and erosion from frontal wave attack and utilized conservative assumptions in regard to the angle of approaching waves in calculating drift (SER Supp. No. 1, pp. 2-9). Erosion from frontal wave attack was estimated from tank tests conducted by the U.S. Corps of Engineers Beach Erosion Board (Tr. 4223; Tr. 4255-56). This analysis assumed that the coastal dunes at the site were eroded away before erosion from the postulated hurricane begins (Tr. 4200). This analysis also paid attention to erosion taking place near the heat sink barrier and other vulnerable areas. It was estimated that the closest approach of erosion to any safety related structures would be 160 feet (SER Supp. No. 1, pp. 2-9 to 2-13) and would not affect the safety of the plant (Tr. 4184).

48. The Applicant analyzed possible current-induced erosion that would arise due to a breach of Hutchinson Island at Big Mud Creek (SER Supp. No. 1, p. 2-13; Tr. 4190-91, 4195-96, 4358-61). The erosional effects from these water movements were evaluated by the Applicant and were considered to be minimal (SER Supp. No. 1, p. 2-12). The Applicant considered erosion protection for the ultimate heat sink barrier dam at the northwest side of the nuclear island. A sheet steel bulkhead and two steel pile groins on the east side of the ultimate heat sink channel to Big Mud Creek and a sheet pile groin on the west side of the channel are needed to provide protection. This sheet pile will protect the barrier wall from the possible erosion from both the littoral drift and from frontal wave attack (SER Supp. No. 1, p. 2-11). The three groins will prevent intrusions of material into the emergency intake canal (Caldwell, Tr. 4237-4241). Accordingly, the Board requires the Applicant to install the additional protection described above as a condition of any license issued pursuant to this Decision. The Staff and the Applicant found that no adverse effects would result to the plant safety related facilities from erosion as a result of the postulated hurricanes if this additional protection is provided (SER Supp. No. 1, p. 2-11). The Board concurs.

49. Considering all of the evidence, the Board finds that there is reasonable assurance that the erosional effects at the site from a high intensity-long dura-

tion hurricane will not cause this site to be unsuitable. The Staff has concluded that the design of the St. Lucie Unit No. 2 is adequate to withstand the postulate stalled hurricane (SER Supp. No. 1, p. 2-13). The Board concurs in this opinion.

V. APPLICANT'S HEALTH PHYSICS PROGRAM

50. In the Partial Initial Decision (1 NRC at 111, para. 26), we noted that Witness Karl Z. Morgan questioned the Applicant's health physics program described in Section 12 of the Preliminary Safety Evaluation Report (PSAR) and summarized at page 12-5 in the Safety Evaluation Report (SER) issued by the Staff.

51. Dr. Morgan was concerned with the identification and qualifications of responsible health physics personnel to be employed at the St. Lucie Plant Unit No. 2 (Tr. 2880-2883, 3080-3092; Morgan, following Tr. 3052, p. 2). Dr. Morgan criticized the Applicant's health physics program in that it did not indicate that during operation of St. Lucie Unit No. 2 the Applicant would employ well educated, well trained, experienced, and competent personnel to implement good and sound health physics practices and procedures within the meaning of Regulatory Guides 8.8 and 8.10 to keep occupational exposures as low as is reasonably achievable (Tr. 2882-2883). Dr. Morgan was also concerned that a competent health physicist would not have a significant input in the plant design and facility layout at the early design stages from the point of view of designing the plant to keep occupational exposures as low as is reasonably achievable (Morgan, following Tr. 3052, p. 2).

52. Based on the concerns expressed by Dr. Morgan at the earlier hearing, the Board indicated its intent to inquire in greater detail into the Applicant's health physics program during the health and safety phase of this proceeding (1 NRC at 111, para. 26). The Board considered the Applicant's health physics program in detail at the health and safety hearings held on May 20-21, 1976, and May 25-28, 1976, pursuant to the Order following Prehearing Conference of April 29, 1976.

53. The Board finds that Applicant will employ a competent qualified health physicist meeting the requirements of Regulatory Guides 8.8 and 8.10; that Applicant's description of its health physics program to date is acceptable and meets regulatory requirements for the construction permit phase; and that Applicant's described health physics program meets the Commission's requirement that occupational dose exposures be kept as low as is reasonably achievable.

54. The Board specifically finds that Applicant has employed a competent and well trained health physicist and health physics staff meeting the requirements of Regulatory Guide 8.8 with respect to experience and training; that the

health physicist, including the Corporate Health Physicist, Harvey M. Story, will have a significant input into the plant design and facility layout at the early critical design phase of St. Lucie Unit No. 2; and, therefore, that there is reasonable assurance that exposure to plant personnel during operation will be as low as is reasonably achievable (SER §12.3; PSAR §12.3; Story, following Tr. 3879; Nehemias, Health Physics, following Tr. 4450; Whipple, following Tr. 3748, pp. 14-18; 20-21). We conclude, therefore, that the point raised by Dr. Morgan that a competent health physicist should be employed during the design of a nuclear power plant has been sufficiently addressed by the Applicant.

55. Our conclusions are based on the PSAR description of the Applicant's health physics program, including its description of the actions taken at the early critical design phase with respect to review of the design of the plant from an overall health physics and radiation protection perspective, and its operating procedures (SER §12; PSAR §12).

56. Applicant's Witness Story testified that a major aspect of the Applicant's program to keep occupational doses as low as is reasonably achievable (ALARA) is the proper design of the overall facility in order to limit radiation exposures to personnel during normal plant operations, maintenance, and inspection and other service modes (Story, following Tr. 3879). Through proper design, anticipated exposures to personnel will be minimized by shielding and segregation of radioactive equipment, isolation of such equipment from "cold" corridors and general access areas, and radiation protection design measures for maintenance, inspection and other servicing operations (*Ibid.* p. 7). The design of the St. Lucie Unit No. 2 plant is based upon operating experience in the general nuclear industry as well as design and operating experience at Turkey Point and St. Lucie Unit No. 1 (*Id.*). The approach adopted by the Florida Power and Light Company to implement ALARA involves the development of a program for the evaluation of plant design and facility layout, and the establishment of detailed health physics procedures (*Id.*). The design of St. Lucie Unit No. 2 was reviewed and evaluated by the Applicant's health physics staff. Mr. Harvey F. Story, the Corporate Health Physicist, testified that he was involved in the review and the design of St. Lucie Unit No. 2 (Tr. 3942). Examples of changes incorporated into the St. Lucie Unit No. 2 design as a result of Mr. Story's review, and the review by the Applicant's health physics staff include:

1. A rerouting of traffic patterns in the personnel change areas to limit the spread of contamination;
2. Use of increased shielding around waste gas decay tanks;
3. Increased control of personnel access to demineralizers by providing lockable gates around this equipment in order to minimize inadvertent exposures; and

4. Modification of shielding in the demineralizer valve area in order to decrease the required maintenance times (Story, following Tr. 2879, p. 10).

57. The Board has reviewed the evidence with respect to the design of the facilities and equipment, including the major features incorporated into the plant design to minimize in-plant radiation exposures (Story, following Tr. 3879; Nehemias, following Tr. 4450; PSAR § 12, SER § 12; SER Supp. No. 1, § 12). The Board concludes that the design meets the Commission's ALARA criteria.

58. Witness Nehemias testified that Applicant was required to have a competent health physicist review the design of the plant from a health physicist's perspective (Tr. 4482). Applicant's Witness Story testified that he was the health physicist responsible for reviewing the design of St. Lucie Unit No. 2 from a health physics perspective (Tr. 3942-3943). Witness Nehemias testified that at the time of application for construction permit, the Applicant is required to submit a PSAR containing information relevant to radiation protection (Nehemias, following Tr. 4450, p. 2). The Applicant is required to present information on ventilation, radiation source terms, and handling of radioactive wastes. The principal considerations at this preliminary stage of review are plant design layout, organization (including health physics review and responsibility at a level high enough to assure radiation protection input in plant operating and safety decisions) and a management commitment to maintain occupational radiation exposures as low as is reasonably achievable (Nehemias, following Tr. 4450, SER § 12).

59. In the earlier environmental and site suitability hearing, Intervenors' Witness Dr. Morgan stated that the Applicant:

> did not have adequately trained manpower, knowledgeable people, experienced people to look after the health of the employees and to certify that the levels of contamination in the environment were at acceptable levels. (Tr. 2881)

60. Based on our review of the Applicant's health physics program, we find that the Applicant has adequate and competent health physics personnel in its employ, and that sufficient training from the health physics standpoint will be implemented at St. Lucie Unit No. 2. Further, we find that the Applicant's approach to the radiation protection aspects of design and construction of St. Lucie Unit No. 2 is acceptable, and, therefore, will result in reasonable assurance that personnel exposures will be as low as is reasonable achievable (Story, following Tr. 3879). Applicant's health physics program (including that program set out in the Applicant's Health Physics Manual) requires that all individuals responsible for recommending implementing the ALARA program have appropriate training, education or experience in the field of health physics (Story, following Tr. 3879). The Applicant's health physics manual requires that the Corporate Health Physicist have, as a minimum, a degree in radiological science

or engineering and at least six years of professional health physics experience. These qualifications are equivalent to those required for certification by the American Board of Health Physics. The qualifications of Mr. Story, the Corporate Health Physicist, meet the requirements of Applicant's health physics program and are consistent with those outlined in Regulatory Guide 8.8 (Story, Professional Qualifications, following Tr. 3879, p.15). Applicant requires that the health physics supervisor at the plant must have a degree in science or engineering and at least five years of applied radiation protection experience. This requirement also is consistent with those outlined in Regulatory Guide 8.8 (*Id.*). Health physics staff members initially receive an extensive review of their training experience. Personnel employed as plant health physics technicians are required to have at least two years of applied health physics experience. The required orientation and training program addressed such items as basic nuclear physics, the biological effects of radiation, radiation detection instruments, personnel monitoring, emergency procedures, and practicable application of health physics.

61. Besides this initial qualifying review program, a refresher course is given to the plant health physics staff members every two years (Story, following Tr. 3879). Detailed training is also required for personnel who require unescorted access into restricted areas. These training procedures meet the rquirements of the regulations, specifically 10 CFR §19.12 (*Ibid.*). Therefore, there is reasonable assurance that occupational exposures will be as low as is reasonably achievable.

62. The Board examined the radiation protection aspects of the Applicant's design and construction program. The Board finds that there is reasonable assurance that implementation of the program described by the Applicant will result in exposures to employees as low as is reasonably achievable. Florida Power & Light Company has developed procedures designed to control activities carried out in high radiation areas. These procedures will enable the plant staff to maintain in-plant exposure ALARA by requiring (1) careful planning of preparation for maintenance, inspection, refueling, and nonroutine activities in all radiation zones: (2) multilevel review of all health physics procedures and operations; (3) review of plant operating experience to determine if procedural or design modifications need to be instituted (Story, following Tr. 3879).

63. One of the major aspects of Florida Power & Light planning procedures is the radiation work permit (RWP). The radiation work permit procedures authorize personnel to enter or perform work in areas where radiological conditions require special radiation protection measures. They insure that radiological conditions have been fully evaluated, that the job has been adequately preplanned, and that plant personnel are fully aware of the radiological conditions, the protective clothing necessary, and the special equipment requirements mandated by health physics personnel's review (*i.e.*, portable shielding and any spe-

cial health physics instruction developed for the specific work tasks requested) (Story, following Tr. 3879).

64. Applicant's operating procedures require routine surveys for radiation and airborne contamination on a regular basis. Procedures for use of protective clothing and equipment required when entering contaminated areas are also described by the Applicant (*Id.*).

65. In addition, the described radiation practices and procedures are subject to continuing reviews (*Id.*). The health physics supervisor at St. Lucie Unit No. 2 will have stop-work authority on particular jobs once the plant becomes operational. He has direct communications with higher levels of management, independent of normal in-plant administrative organizational structures, and procedures and requirements are established for daily communication between the Corporate Health Physicist and plant health physicist personnel. This will insure that there will be continuing attention to implementation of radiation protection by means of an adequate and sound health physics program (Story, following Tr. 3879).

66. We conclude that St. Lucie Unit No. 2 health physics program is acceptable and will result in exposures at St. Lucie Unit No. 2 as low as is reasonably achievable.

VI. PROJECTED OCCUPATIONAL DOSES

67. The Board finds that the establishment of a total annual occupational dose value as an operating limit for normal operating conditions exclusive of unplanned-for maintenance, emergency operations, or nonroutine operations, would be inappropriate and is not supported by the weight of the evidence in this case. The programmatic approach followed by Applicant meets the approach recommended by the Staff in Regulatory Guide 8.8 for complying with the Commission's as low as reasonably achievable criteria. Accordingly, we find that the program developed by the Applicant for controlling occupational dose exposure complies with the Commission's criteria of keeping doses "as low as is reasonably achievable" (ALARA) (10 CFR §20.1(c)).

68 In its Partial Initial Decision (para. 126), the Licensing Board imposed a 75 man-rems/year condition as guideline dose for in-plant occupational exposure (1 NRC 101, 111-112, 157). Following consideration of the Applicant's Motion for Reconsideration, on April 25, 1976, the Licensing Board cancelled the imposition of the 75 man-rems/year guideline dose for in-plant occupational exposure. *Supplement to the Board's Partial Initial Decision–Re Applicant's Petition for Reconsideration, Florida Power and Light Company* (St. Lucie Nuclear Power Plant, Unit No. 2), LBP-75-23, 1 NRC 463, 464-465. However, the Board directed the Staff to offer further evidence on the matter at the health and safety hearing (1 NRC at 465). The Board's imposition of the 75 man-rems/year

limitation was based on its conclusions: (1) that the cost-benefit balance in the FES, which was based on consideration of the average operating exposure experience of 450 man-rems/year, can be further improved if occupational dose is reduced from 450 man-rems/year to 75 man-rems/year; (2) the possibility of reducing the in-plant exposure to operating personnel; (3) that the St. Lucie Unit No. 1 Licensing Board used the 75 man-rems/year in its NEPA cost-benefit balance; and (4) that a 75 man-rems/year guideline would give the Applicant further incentive to take reasonable steps to minimize exposures to plant personnel (1 NRC at 464). The Staff estimate of 450 man-rems/year per plant, used for NEPA cost-benefit balance purposes in the FES, was based on past experience from operating reactor plants (FES, 5-22, Staff Exhibit 1, following Tr. 362) (1 NRC at 111-112). The Staff estimated that the average collective dose to all onsite personnel at large operating nuclear reactor plants will be approximately 450 man-rems/year per plant (FES, 5-22), although the total dose experienced at a particular plant in a given year may be considerably above or below this value (1 NRC at 111-112) (Nehemias, Occupational Dose, following Tr. 4450, p. 2).

69. At the earlier environmental and site suitability hearing intervenors' Witness Morgan stated his opinion that 900 man-rems (450 man-rems/year per plant x two units at St. Lucie) is too high (Morgan, following Tr. 3052, p. 2; Tr. 2902, 3103, 3126), but Dr. Morgan wondered which estimate (75 or 450) is more realistic (Tr. 2902). In its Partial Initial Decision, the Board found it significant that witnesses for the Applicant, the Staff and Intervenors agreed that the expected radiological effects from occupational exposure did not affect the cost-benefit balance for St. Lucie Unit No. 2, and that Intervenors' expert witness Morgan believed that, even with the alleged risks, the expected benefits outweigh the expected costs (Tr. 3127, 3174) (1 NRC 101, 112).

70. At the hearings held on May 20-21, 25-28, 1976, the Applicant presented one witness, Dr. G. Hoyt Whipple, with respect to the proposed 75 man-rems/year limits on total in-plant occupational dose (Tr. 3748). The Staff presented one witness, Dr. John V. Nehemias (Tr. 4450). Witness Nehemias testified that the value of 450 man-rems/year is included by the NRC in environmental statements as an estimate of the average collective dose to all onsite personnel for a large modern operating nuclear power plant (Nehemias, following Tr. 4450). The value of 450 man-rems/year is an average value based on recent experience. It is not a projection of actual expected doses to personnel at particular plants and is not based on any plant specific considerations (*Id.*, pp. 1-2). The average value of 450 man-rems for one plant (900 man-rems for St. Lucie Unit No. 1 and Unit No. 2) is used for environmental assessment purposes, and, therefore, was never intended for use as an operating limit (*Id.*, p. 1). An operating limit of this kind has never been imposed on any operating light water

nuclear power reactor, nor proposed for any construction permit (*Id.*, p. 1). The figure of 450 man-rems/year, used by the Staff as an estimate of average occupational exposure, was compiled based on data gathered from operating nuclear power plants and is found in the NRC document, NUREG-75/032, "Occupational Radiation Exposure At Light Water Cooled Power Reactors," 1969-1974 (*Id.*, p. 2). Dr. Nehemias testified that the data compiled to date from large modern operating nuclear power plants indicate that for any given year and for any given plant the dose may be higher or lower depending on a number of factors (Nehemias, Occupational Exposures, following Tr. 4450, pp. 2, 7-8). Experience at any given operating reactor will vary widely year by year from this average value for total occupational dose (*Ibid.*). Higher doses may result from a higher incidence of required maintenance and repairs, or from higher dose rates encountered during inspection and refueling (*Id.*).

71. In most cases major maintenance, repairs, and inspections can be planned in advance, and are considered to be normal operating events (*Id.*). However, it is difficult to predict dose rates that may be encountered during completion of such tasks (Tr. 3818, 4462; Nehemias, Occupational Exposures, following Tr. 4450, p. 4; Whipple, following Tr. 3748, p. 22). In addition, man-rem dose experience is difficult to predict due to the unpredictable timing of mechanical failures requiring maintenance, repair, or replacement (Nehemias, Occupational Exposures, following Tr. 4450, p. 8). Thus, total occupational doses in man-rems/year, due to major maintenance, repairs, inspection, and refueling cannot be limited in advance, since actual dose rates cannot be predicted with any degree of confidence in advance of plant operating experience (Whipple, following Tr. 3748, p. 14; Tr. 4456; Nehemias following Tr. 4450, p. 2, Tr. 3818; 4462-4463). Thus, if a particular task involves work at high dose rates that could not be predicted in advance, more personnel may be required to complete any given task within the individual dose limits imposed by 10 CFR Part 20. This leads to exposure of a greater number of personnel to complete the task involved, with the consequence that the total occupational dose for in-plant personnel may be increased. Dr. Nehemias testified that significantly lower doses may result during an unusually trouble free year at an operating unit. The range of values for 1974 ranged from 18 man-rems for the lowest plant to the highest value of 1430 man-rems (Tr. 4446; Nehemias, following Tr. 4450, p. 2).

72. Occupational exposures at a substantial number of operating plants have greatly exceeded the annual average value of 450 man-rems/year during those years in which major maintenance or other operating events involving high dose rates were necessary to continued safe plant operation (*Id.*). Thus, values for man-rem exposure of as high as 5000 man-rems have occurred in prior years, (*e.g.*, Indian Point), but are considered necessary for the type of maintenance and situation involved and are acceptable from the benefit-cost balance viewpoint (Tr. 4456).

73. Dr. Nehemias testified that the spread of the data indicates that application of an operating limit for occupational exposures of 450 man-rems/year for today's large, modern nuclear power plants would probably involve severe limitations on power availability due to the likelihood that, in a typical year, for a number of plants, the value of 450 man-rems would be exceeded (Nehemias, following Tr. 4450, p. 2). Dr. Whipple agreed that at the present time there is no responsible body of professional opinion nor sufficient experience and knowledge which would dictate the imposition of numerical guides for total in-plant occupational exposures similar to those recently adopted for individual doses outside restricted areas, *i.e.*, 10 CFR Part 50, Appendix I, to demonstrate compliance with the Commission's criteria of "as low as is reasonably achievable" (Whipple, following Tr. 3748, p. 22; Tr. 4540). The numerical guides for individual exposures was adopted by the Commission as a way of demonstrating compliance with Appendix I only after a number of years of consideration and a lengthy rulemaking hearing (Tr. 4540). On the other hand, we find that imposition of numerical operating limits might lead to situations where the Commission's standard of as low as is reasonably achievable is not met. Thus, Dr. Whipple testified that there might be a tendency of utilities in any given year to defer desirable, though not necessarily mandatory, preventive maintenance until a later year in which there might be a larger margin available before numerical limits are reached (Whipple, following Tr. 3748, p. 22). In some years, for example, during a refueling year, the total occupational dose might approach any preset numerical limitation (*Ibid.*). This could lead to a curtailment of operations of the plant or shutdown of the plant (*Id.*). Thus, as Dr. Whipple stated, it would be in the economic interest of the public for that particular year for a utility to defer desirable mainterance to a later year in which less total annual in-plant occupational exposure had been accumulated (*Id.*). In the long run, however, deferring desirable maintenance could lead to maintenance being performed under less favorable or more urgent conditions resulting in greater total annual occupational doses than would have occurred had the maintenance been done on a more routine, practical basis (Whipple, following Tr. 3748, p. 22).

74. Dr. Whipple testified that occupational dose would still be experienced during necessary inspections and maintenance, even if an occupational dose limit is set and if the plant is forced to curtail production of power or close down operations because it reached the limit. Nuclear plants in a shutdown condition still require attention which results in occupational dose exposure (Tr. 3829).

75. Both the Staff Witness Nehemias and the Applicant's Witness Whipple indicated that setting limits on routine or normal operations in low dose rate areas exclusive of major maintenance in high exposure areas, emergency maintenance, inspection, and refueling operations would not be expected to yield much with respect to saving man-rem dose (Tr. 4522-4523, 4562). This is be-

cause the major portion of the annual in-plant occupational dose comes from nonroutine or unexpected events requiring work in high dose rate areas, or from those events which are expected to occur on a regular basis and which contribute a major part of the occupational dose, although the dose rate and consequent doses are difficult to predict (Nehemias, Occupational Doses, following Tr. 4450; Tr. 4466, 4522-4523).

76. The Board asked the Applicant "to provide documented experience regarding occupational exposures at Turkey Point" (Tr. 3419). Both Applicant and Staff provided data with respect to these exposures (Story, following Tr. 3879; Nehemias, Turkey Point, following Tr. 4450). Both Staff's and Applicant's witnesses testified that the Turkey Point experience reflects the variability expected in the industry with respect to occupational dose exposure. We concur, and find that the experience at Turkey Point does not provide a basis for setting occupational dose guidelines or operating limits for St. Lucie Unit No. 2.

77. Based on consideration of the extensive record on this matter, the Board concludes that it is not feasible at this time to set an in-plant occupational guideline dose limit in man-rems/year as a condition of the construction permit for St. Lucie Unit No. 2 as an incentive to the Applicant to meet the Commission's criteria of keeping occupational doses as low as is reasonably achievable. The man-rem estimate is intended as a tool for comparison with other environmental impacts in the FES. Any particular value would not be specific to any plant or situation in any given year (Nehemias, Occupational Doses, following Tr. 4450, pp. 7-8). Actual man-rem dose experience at modern operating plants indicates wide variability due to the unpredictable timing of mechanical failures requiring major maintenance, repair, or replacement. This variability would make any preselected value unacceptable as an operating limit and would lead to an undesirable operating situation, especially if a plant had to cease or curtail operations in any particular year because of unusually high exposures from major maintenance, or if other operating events caused the plant to approach a preset occupational dose operating limit (Tr. 4554, 4561; Nehemias, Occupational Doses, following Tr. 4450, p. 8). However, the Board finds that the programmatic approach reflected in Regulatory Guide 8.8 can result in occupational doses to plant personnel being as low as is reasonably achievable as it is to be implemented by the Applicant at St. Lucie Unit No. 2 (Nehemias, Occupational Doses, following Tr. 4450, p. 5). By requiring the Applicant to commit to the ALARA principle, to follow the provisions of Regulatory Guide 8.8, or alternative approaches proposed that meet the requirements of Regulatory Guide 8.8, the Staff will assure that the Applicant's occupational doses during operation are ALARA. Regulatory Guide 8.8 spells out, in considerable detail, specific approaches to design detail and radiation protection.

78. Exposures must be maintained ALARA by proper design, shielding and layout. During the operating licensing review process, the Florida Power and

Light Company will be making changes in its proposed plants for the purpose of assuring that occupational radiation exposures will be ALARA. Such changes will be directed either to lowering radiation levels, lowering the probability of situations involving high radiation levels, or reducing the time necessary for operations involving high dose rates (Nehemias, Occupational Doses, following Tr. 4450, p. 6). We conclude that this approach is acceptable and will result in occupational doses being kept to ALARA levels.

VII. COMPLIANCE WITH APPENDIX I TO 10 CFR 50

79. Testimony in this proceeding demonstrated that the discharge of radioactive effluents from the St. Lucie plant will be "as low as practicable" (Partial Initial Decision, 1 NRC at 112). Subsequently, the Commission amended its regulations concerning the discharge of radioactive effluents (10 CFR Part 50, Appendix I). The new regulations establish numerical guidelines for such discharges from nuclear power reactors. In addition, the terminology is changed from "as low as practicable" to "as low as is reasonably achievable," but without substantive change in the concept (Testimony of Walton A. Rodger relating to Appendix I, pp. 1-5, following Tr. 3638).

80. Both the Applicant and the Staff presented evidence of compliance of St. Lucie Unit No. 2 with the new regulations (Testimony of Walton A. Rodger relating to Appendix I, following Tr. 3638; Supplemental Testimony of NRC Staff by Michael A. Parsont, following Tr. 4572; Supplemental Testimony of NRC Staff by Ronald R. Bellamy, following Tr. 4572). New calculational methods were developed by the NRC Staff in order to evaluate compliance with the numerical guidelines of Appendix I (Rodger, pp. 4-5). The calculations were performed using the new calculational methods but assuming that the design of St. Lucie Unit No. 2 remained the same (Rodger, p. 5).

81. Both the Applicant's and the Staff's calculations show that St. Lucie Unit No. 2, as presently designed, meets the Appendix I numerical guidelines by a wide margin (Rodger, pp. 6, 13; Parsont, pp. 6, 8; Tr. 4575). According to Applicant's calculations, individual doses are small percentages of the Appendix I numerical guidelines (Rodger, p. 6). While there are some differences in the results obtained by the Applicant and the Staff, the differences are explained by differences in calculational assumptions and are not significant (Tr. 3648-50).

82. In addition to compliance with the numerical guidelines discussed above, Appendix I requires an analysis to determine whether additional equipment can be added to reduce exposures to the population within 50 miles of the reactor, while maintaining a favorable cost-benefit ratio assuming that each man-rem or man-thyroid-rem of exposure is valued at $1000 (10 CFR Part 50, Appendix I, Section II.D). On September 4, 1975, the Commission amended

Appendix I to allow certain Applicants, among them the Applicant in this case, to dispense with cost-benefit analysis required by Section II.D if their proposed rad-waste systems met the numerical guidelines proposed by the NRC Staff in the Appendix I rulemaking proceeding (Rodger, pp. 8-9; Bellamy, p. 2; Tr. 3630-31). Both the Applicant and the Staff found that Applicant's proposed system meets the requirements of the Staff's proposed guidelines (Rodger, pp. 9, 16; Parsont, pp. 5, 7; Bellamy, pp. 4-6). Accordingly, no cost-benefit analysis under Section II.D of Appendix I is necessary. Nevertheless, in previous testimony, Applicant had provided a cost-benefit analysis of its proposed rad-waste system. In order to bring that analysis up to date, a cost-benefit analysis in accordance with the requirements of Section II.D of Appendix I was provided by the Applicant (Tr. 3631). That analysis shows that the Applicant's proposed system goes beyond cost effectiveness in reducing population doses (Rodger, pp. 7-9, 14).

83. Using Regulatory Staff estimates of population within 50 miles of the plant in the year 2020, the Applicant calculated a slightly lower population dose than in its previous calculations (Rodger, p. 8). Although the record contains several population estimates for various distances from the plant, the Applicant's witness used the largest estimate for the 50-mile area (Rodger, p. 8; Tr. 3713-14, 3726-27). Moreover, a doubling of the Staff's population estimate would not change Dr. Rodger's conclusion (Tr. 3715-16). The Staff calculated an inconsequential increase in population dose (Supplemental Testimony of NRC Staff by Oliver D.T. Lynch, Jr., p. 3, following Tr. 4572).

84. The analysis described above was based on the Applicant's milk animal census which showed that the nearest milk cow was located 7.5 miles south-southwest of the plant (Tr. 4576). However, in a limited appearance statement, a member of the public mentioned that there might be a milk goat nearer the plant (Tr. 3494). Recognizing that there was no evidence of record that milk goats were actually kept there, both Applicant and the Staff calculated the thyroid dose to an infant drinking milk from a goat kept approximately two miles from the plant. Those calculations show that, assuming the existence of a milk goat there, the Applicant's compliance with Appendix I is unaffected (Tr. 3727-28, 4574-75, 4577). In any event, the Board has already required monitoring of the actual location of milk cows, and that condition shall be broadened to include the location of all milk animals (Partial Initial Decision, 1 NRC at 157).

85. At the previous hearings in 1974, Intervenors' witness, Dr. K. Z. Morgan, suggested that certain radionuclides, notably C-14, which should be considered in an analysis of the effects of radioactive effluents from St. Lucie Unit No. 2, were not considered. Additional radionuclides, including C-14, are now required to be included in Appendix I calculations, and were considered by Applicant and Staff (Tr. 3718, 4579-80). Some transuranic isotopes were considered for inclusion by the Applicant, but were not included in the analysis

because they were insignificant in amount and effect and would not change the outcome of the calculations (Tr. 3718-20).

86. Dr. Morgan also suggested that dose commitments, not simply current first year doses, should be calculated. The Board indicated in the Partial Initial Decision (paras. 24, 112, 1 NRC, pp. 110, 151) that it would hear further evidence concerning dose commitments. However, that request was withdrawn at the prehearing conference of April 9, 1976 (3440). Appendix I now requires the calculation of dose commitments (Rodger, p. 6; Tr. 3729-31). The concerns have been resolved.

87. Based on the Appendix I analysis described above, the Staff and the Applicant concluded that the environmental assessment of the proposed plant is unchanged (Testimony of Roger E. Linnemann, relating to Appendix I Dose Effects, p. 1, following Tr. 3641; Lynch, pp. 3-4; Tr. 4576). The doses expected from normal operations of St. Lucie Unit No. 2, even at Appendix I limits, are medically insignificant (Linnemann, p. 1, following Tr. 3720-24). Accordingly, based on all of the evidence discussed above, the Board finds that St. Lucie Unit No. 2 complies with 10 CFR Part 50, Appendix I.

VIII. FUEL DENSIFICATION

88. Intervenors' Contention 3.4, as admitted by the Board (Prehearing Conference Order #3, July 12, 1974), reads as follows:

> *Contention 3.4* Whether the Applicant in its proposed design and construction of St. Lucie Plant No. 2 has considered and adequately provided for any possible adverse affects of fuel densification.

Consideration of this contention was deferred until the health and safety phase of this proceeding which commenced on May 20, 1976. Intervenors subsequently withdrew Contention 3.4 insofar as it was a separate issue unrelated to emergency core cooling. The Board received evidence on its own initiative (Testimony of R.D. Hankel, following Tr. 4612; affidavit of Ralph O. Meyer, following Tr. 3625).

89. Fuel densification was first observed several years ago and was the subject of a detailed generic review by the AEC/NRC Regulatory Staff (Hankel, pp. 1-3; Meyer, pp. 1-2). The NRC Staff considers the matter resolved (Meyer, p. 7). For St. Lucie Unit No. 2, measures have been implemented to prevent fuel densification, including manufacturing controls during fuel pellet fabrication and internal presurrization of fuel rods (Hankel 3.4, pp. 3-5). The Staff's evaluation included the effects of fuel densification on gap conductance, linear heat generation rate, local power spiking, and potential cladding collapse and concluded that the matter was adequately treated by the Applicant (Meyer, pp. 7-9).

Accordingly, the Board concludes that fuel densification has been considered, and adequately provided for, in the design of St. Lucie Unit No. 2.

IX. EMERGENCY CORE COOLING SYSTEM (ECCS)

90. Intervenors' Contention 3.3, as admitted by the Board (Prehearing Conference Order #3, July 12, 1974), reads as follows:

Contention 3.3 Whether Applicant's proposed emergency core cooling system, or ECCS meets the requirements of AEC regulations.

Consideration of this contention was deferred until the health and safety phase of this proceeding which commenced on May 20, 1976.

91. Acceptance criteria for emergency core cooling systems for light water reactors are set forth in 10 CFR §50.46. The effectiveness of the ECCS must be evaluated for every plant in accordance with Appendix K of 10 CFR Part 50. At the time of publication of the SER (Safety Evaluation of the St. Lucie Unit No. 2, November 7, 1974), the Staff had not completed its evaluation.

92. Supplement No. 1 to the SER (March 3, 1976) contains an evaluation of the ECCS for St. Lucie Unit No. 2. It was concluded that the ECCS for St. Lucie Unit No. 2 would satisfy the criteria set forth in 10 CFR §50.46 provided the peak linear heat generation rate were restricted to a maximum of 12.4 kw/ft (SER Supp. No. 1, Sec. 6.3).

93. At the evidentiary hearing on May 28, 1976, Applicant's witnesses Dr. R. D. Hankel and Dr. W. A. Goodwin (Tr. 4607-97), and Staff witnesses G. N. Lauben and W. B. Hardin (Tr. 4701-42), discussed errors that had been discovered in the Combustion Engineering computational model during an internal audit of computer codes. Prepared testimony by Dr. Hankel relating to Contention 3.3 (Hankel 3.3, following Tr. 4612) was corrected (Tr. 4609) to reflect changes from computed results reported in Supplement No. 1 of the SER and in the prepared testimony (Hankel 3.3). In particular, the peak linear heat generation rate for compliance was reduced from 12.4 kw/ft to 11.6 kw/ft.

94. Other modifications to the Combustion Engineering ECCS computational model were described at the evidentiary hearing on December 1, 1974 (Applicant's witnesses Dr. J. M. Betacourt and Dr. W. A. Goodwin, following Tr. 4822; Staff witnesses L. E. Phillips, following Tr. 4837, and B. Hardin, following Tr. 4840). Modifications to the STRIKIN-II computer code described be Betacourt were used in the reanalysis discussed by Goodwin. Significantly, the peak linear generation rate for compliance remained at 11.6 kw/ft (Goodwin, following Tr. 4822). The Staff's evaluation (Phillips, following Tr. 4837; Hardin, following Tr. 4840) concludes that the ECCS performance for St. Lucie Unit No. 2 will conform to the criteria of 10 CFR §50.46.

95. The ECCS analysis considered a spectrum of possible breaks in the primary coolant piping. The worst break was determined to be a double-ended guillotine break with a discharge coefficient of 1.0 (Hankel, p. 2; Hardin, Sec. 3.0). The worst case assumes this pipe break together with a failure of one low pressure safety injection pump, a failure of control rods, and a loss of offsite power (Hankel, pp. 3-4; Tr. 4666-68, 4679, 4691-92).

96. The Combustion Engineering ECCS evaluation model conforms to the requirements of 10 CFR Part 50, Appendix K, and has been found acceptable to the Staff (Hankel, Goodwin, p. 1; Tr. 4737, 4837, 4846-47). Only one of the several modifications to the computer code had a significant effect on the analysis for St. Lucie Unit No. 2; this was the error in treating the guide tube for a control element assembly (Goodwin, p. 1; Betacourt, p. 2).

97. The Staff raised a question because the STRIKIN-II code originally allowed the possibility of a return to a pre-CHF regime (nucleate boiling) after CHF (critical heat flux) had been reached at some location (Betacourt, pp. 1, 4). Because of Staff concerns about literal compliance with paragraph I.C.4.e of Appendix K to 10 CFR Part 50, CE was required to "modify the STRIKIN-II code to preclude a return to nucleate boiling during blow-down after critical heat flux is predicted" (Betacourt, p. 5; Hardin, Sec. 2b).

98. The underlying heat transfer correlations used by the STRIKIN-II code for predicting CHF are flow dependent and were generated under steady state conditions for unidirectional flows. In going through flow reversal, a condition of zero flow exists at some point in time, thus leading the code to predict CHF. Since the initial prediction of CHF was artifically obtained, the surface temperature is not high enough to be in a post-CHF regime and the code allowed return to a pre-CHF regime as the flow picked up again (Betacourt, p. 4).

99. In accordance with requirements imposed by the Staff, the STRIKIN-II heat transfer logic has been modified to prevent a pre-CHF regime from recurring once CHF is first predicted to occur. The condition is enforced in the new version of the code, even if the calculated fluid and surface conditions would apparently justify the reestablishment of a pre-CHF regime. The constraint imposed by the NRC Staff was met in STRIKIN-II by extrapolating the film boiling post-CHF correlation to the pre-CHF regime (Betacourt, p. 5). This change in the code has been used to study blowdown and reflood with CE System 80 fuel, which is similar to that planned for St. Lucie Unit No. 2, with negligible effect on peak clad temperature (less than 2°F) and virtually no change in peak clad oxidation (Phillips, p. 19).

100. We conclude that, of the changes in the STRIKIN-II code brought forth in this proceeding, only one has significance for St. Lucie Unit No. 2: the error in treating the control assembly guide tube (Betacourt, p. 2) which was the main cause of the reduction in the maximum permissible linear heat rate from 12.4 kw/ft to 11.6 kw/ft (Tr. 4609). The significance is not great because the

additional constraint on linear heat rate is a slight constraint on reactor power distribution without affecting the total power (Tr. 4829).

101. Based on the 11.6 kw/ft. peak linear heat rate, the most severe pipe break for St. Lucie Unit No. 2 is calculated to result in a peak fuel clad temperature of 2120°F, a peak local clad oxidation percentage of 15.85%, and a highest corewide oxidation of less than 0.902% (Goodwin, pp. 2-3; Hardin, Sec. 3.0). These calculated values comply with the criteria stated in 10 CFR §50.46: namely, 2200°F, 17%, and 1.0% respectively. Furthermore, the calculations indicate that the ECCS design will maintain a coolable core geometry and provide long-term cooling as required by 10 CFR §50.46 (Goodwin, pp. 2-3; Hardin, Sec. 4.0).

102. Additional technical or design information as needed to complete the safety analysis will be supplied in the final safety analysis report, and research and development programs will be conducted as needed. This includes certain matters relevant to ECCS (Tr. 4706-10; 4731-32) which need not be further considered at this time.

103. The Staff has concluded that the ECCS performance for St. Lucie Unit No. 2 conforms to the Commission's regulations (Hardin, Sec. 4.0). Based on the foregoing, the Board concurs and concludes that Intervenors' Contention 3.3 has been resolved favorably to the Applicant.

X. QUALITY ASSURANCE

104. The Safety Evaluation Report (SER) for St. Lucie Plant, Unit No. 2, was issued by the Atomic Energy Commission in November 1974. The SER described the Quality Assurance Organization for Florida Power and Light, the Applicant, EBASCO Services, Inc. ("EBASCO"), the constructor, and Combustion Engineering, Inc., the NSSS supplier. The Staff concluded that each of the Quality Assurance (QA) organizations described in Section 17.1 of the PSAR for St. Lucie Unit No. 2 had sufficient independence and authority to establish and implement its QA program without undue influence of cost and schedule. In addition, the Staff concluded that the QA programs of the Applicant, EBASCO and CE contained the necessary provisions, requirements and controls which, if adequately implemented, would result in compliance with Appendix B of 10 CFR Part 50 for the design and construction of St. Lucie Unit No. 2.

105. In March 1976, the U. S. Nuclear Regulatory Commission issued Supplement No. 1 to the Safety Evaluation Report describing organizational and programmatic changes in the QA program since the issuance of the SER. The most significant change is that the Applicant will use its own personnel, instead of EBASCO to perform onsite inspection activities formerly delegated by the Applicant to EBASCO. Generally, the Applicant's organization with respect to Quality Assurance remains unchanged. The Staff again reviewed the Quality

Assurance organization for EBASCO and Combustion Engineering, Inc. The Staff's previous conclusions concerning Quality Assurance at St. Lucie Unit No. 2 remain unchanged.

106. At the prehearing conference on April 9, 1976, the Board directed the Applicant to address matters concerning Quality Assurance and Quality Control, particularly (1) organization, (2) communication within the organization, (3) lines of authority and responsibility, and (4) experience at St. Lucie Unit No. 1 (Tr. 3418-3419 and "Order Following Prehearing Conference" dated April 29, 1976).

107. Applicant introduced the testimony of J. E. Vessely, Manager of Quality Assurance for the Florida Power and Light Company (Tr. 3986). Mr. Vessely testified that the detailed Quality Assurance Program for construction for St. Lucie Unit No. 2 was set forth in Chapter 17 of the PSAR. He stated that the Quality Assurance Program was designed to meet the requirements of all 18 criteria of Appendix B to 10 CFR Part 50 and that the Quality Assurance Program followed the guidance of:

1. ANSI N45.2, "Quality Assurance Program Requirements for Nuclear Power Plants";
2. The NRC "Gray Book"–"Guidance on Quality Assurance Requirements During Design and Procurement Phase of Nuclear Power Plants" dated May 10, 1974;
3. The NRC "Green Book"–"Guidance on Quality Assurance Requirements During the Construction Phase of Nuclear Power Plants," dated May 10, 1974;
4. The NRC "Orange Book"–"Guidance on Quality Assurance Requirements During the Operations Phase of Nuclear Power Plants," dated October 26, 1973 (Vessely, p. 2).

108. Mr. Vessely testified that the Florida Power and Light Quality Assurance Manual dated February 1974 provides the details of the program elements, requirements, management plants, and implementation responsibilities and is kept current through revision (Vessely, p. 2).

109. The Applicant described its organization with respect to quality assurance and submitted with its testimony a detailed organizational chart which showed the relationship between the manager of Quality Assurance, the Vice President–Nuclear and General Engineering, the Quality Assurance Committee and the Company Nuclear Review Board. The testimony demonstrated that the Applicant is aware of its ultimate responsibility with respect to quality assurance. The Quality Assurance programs of the architect-engineer (EBASCO) and the NSSS supplier (Combustion Engineering) were accepted by the Applicant after thorough evaluation to assure that they complied with applicable require-

ments (Vessely, p. 4). Construction quality control within the plant construction department is responsible for conducting quality control inspection and support activities required to assure construction work and activities meet the requirements of the plans, specifications, codes and corporate standards established by the Quality Assurance department. These activities were formerly delegated to EBASCO, the architect-engineer but are now the responsibility of the Applicant. Mr. Vessely further testified that the freedom and independence of the onsite Quality Assurance (QA) organization from cost and scheduling matters is preserved by the administrative reporting relationship of the onsite project quality control supervisor to the offsite superintendent of construction quality control who has, in turn, no responsibility for cost and scheduling (Vessely, p. 6).

110. Mr. Vessely then discussed the lines of communication between the Applicant and its contractors which exist through Florida Power and Light Project General Management organization. The Quality Assurance organizations of EBASCO and Combustion Engineering communicate directly with the Manager of Quality Assurance through the Project Manager of each organization to the Florida Power and Light Project General Manager (Vessely, p. 7).

111. With respect to responsibility and authority, the Quality Assurance Committee, chaired by the Executive Vice President for Operations, and comprised of executive level management, is responsible for review and evaluation of the QA Program, and for initiating policy changes where necessary. This Committee is the final authority for resolution of contested quality policies, differences of opinion, and stop-work or other corrective action requests when agreement cannot be reached at lower levels. The head of each organization performing quality related activities is responsible for: identifying those activities within his organization which are quality related as defined by the QA program; establishing and clearly defining the duties and responsibilities of personnel within his organization who execute those quality related activities; and planning, selecting and training personnel to meet the requirements of the QA program (Vessely pages 6, 7 and 8).

112. Mr. Vessely also addressed quality assurance experience at St. Lucie Unit No. 1. Initially the quality assurance responsibility was delegated to EBASCO. The quality assurance staff at that time was relatively small and in 1972 qualified personnel were added to augment quality assurance efforts. By 1973 the quality assurance department consisted, as it does now, of a manager of quality assurance with five assistant managers (at the present time the Applicant's quality assurance department consists of 48 full-time professional or technical personnel). The Applicant indicated that through the eight-year construction period of St. Lucie Unit No. 1 there were only 115 construction related items identified by the AEC/NRC as requiring action and that all these items have been resolved (Vessely, p. 10).

113. At the evidentiary hearing on May 25, 1976, the Board interrogated

three Staff witnesses with respect to quality assurance (Tr. 4044 *et seq.*). Lawrence E. Foster was the principal reactor inspector for St. Lucie Unit No. 1 for approximately four years. Fred J. Liederbach, Senior Staff Member of the Quality Assurance Branch, Office of Nuclear Reactor Regulation, reviewed the quality assurance section of the Applicant's PSAR. Charles E. Murphy is the Chief of the Reactor Construction and Engineering Support Branch, Region II of the Office of Inspection and Enforcement, U. S. Nuclear Regulatory Commission. These Staff witnesses testified that they took no exception to the evidence presented to the Board by the Applicant and that they were satisified that the Applicant's Quality Assurance Program is complete and aceptable (Tr. 4064).

114. This Board concurs that the Quality Assurance Organizations described have sufficient independence and authority to establish and implement those programs without undue influence of cost and schedule. In addition, we conclude that the QA programs of the Applicant, EBASCO, and Combustion Engineering contain the necessary provisions, requirements and controls which, if adequately implemented, will result in compliance with Appendix B of 10 CFR Part 50 for the design and construction of St. Lucie Unit No. 2.

XI. URANIUM FUEL CYCLE

115. On April 22, 1974, the Atomic Energy Commission published a new subsection 15 to Section A of Appendix D to 10 CFR Part 50 which contained Table S-3–Summary of Environmental Considerations for Uranium Fuel Cycle (39 *Fed. Reg.* 14188). The table reflects the contribution of the environmental effects of uranium mining and milling, the production of uranium hexafluoride, isotopic enrichment, fuel fabrication, reprocessing of irradiated fuel, transportation of radioactive materials and management of low level wastes and high level wastes related to uranium fuel cycle activities to the environmental cost of a nuclear power reactor.

116. Table S-3 was not presented in the AEC Final Environmental Statement for St. Lucie Unit No. 2, issued in May of 1974. In paragraph 120 of this Board's Partial Initial Decision–Environmental and Site Suitability, LBP-75-5, 1 NRC 101 (February 28, 1975), the Board stated that it had considered the Staff's cost-benefit analysis and had reviewed if in light of the evidence of record and had concluded that the benefits far outweighed the identifiable environmental costs. The Board further stated, in arriving at this conclusion, that it had independently considered the effects of the uranium fuel cycle activities as quantified and set forth in Table S-3 of Appendix D to 10 CFR Part 50 and had concluded that these effects would not materially change the results of the cost-benefit analysis.

117. Since the issuance of ALAB-335, *supra*, key portions of the Commission regulations with respect to fuel reprocessing and waste management have

been invalidated by a Court of Appeals (9 ERC 1149, D. C. Cir. 1976). Following the Court's decision, the Commission published a General Statement of Policy (Policy Statement) in the *Federal Register* on August 16, 1976 (41 *Fed. Reg.* 34707), which announced its intention to reopen the proceedings underlying the regulation overturned by the Court, and to reconsider the portions of Table S-3 pertaining to waste management and fuel reprocessing which were ruled invalid by the Court. The Policy Statement also announced that the Commission proposed to proceed in this area once again via rulemaking procedures. It stated that an interim regulation on the fuel reprocessing and waste management aspects of the fuel cycle might be promulgated as early as December 1976, but directed that no full power operating licenses, construction permits, or limited work authorizations should be issued in the meanwhile (41 *Fed. Reg.* 34707). With respect to contested Licensing Board proceedings, the Policy Statement directed that "reprocessing and waste management issues should be deferred pending completion of the interim rulemaking, unless the evidentiary record on those issues has already been completed and is adequate for decision" (*Ibid.*), and final action on issues subject to review by an appeal board should be deferred at least pending publication of a new Staff environmental survey of the subject (41 *Fed. Reg.* at 34709).

118. On October 8, 1976, the D. C. Court of Appeals stayed its mandate. The Court stated that the Commission "shall make any licenses granted between July 21, 1976, and such time when the mandate is issued subject to the outcome of the proceedings herein" (*NRDC* v. *NRC, supra*). On October 12, 1976, the Commission released a supplement to its environmental survey of the nuclear fuel cycle entitled "Environmental Survey of the Reprocessing and Waste Management Portions of the LWR Fuel Cycle," NUREG-0116 (Suppl. 1 to WASH-1248). The Commission also issued a notice of proposed rulemaking indicating its present belief that adoption of a final interim rule setting revised values for the contributions of the waste management and reporcessing portions of the LWR fuel cycle to the environmental impacts of an individual reactor could be possible within three months.

119. On November 5, 1976, the Commission announced that licensing could resume on a conditional basis using the existing Table S-3, if, but only if, the revised values set forth in NUREG-0116 are examined to determine whether, if those values were used, the result would tilt the cost-benefit balance against the issuance of the license (Supplemental General Statement of Policy, 41 *Fed. Reg.* 49898, November 11, 1976).

120. On December 28, 1976, the Applicant filed a motion for summary disposition of the fuel cycle issue prescribed in the Supplemental General Statement of Policy. On January 3, 1977, this Board denied the motion, and on January 11, 1977, received evidence on the issue that had been delineated by the Commission in its Supplemental General Statement of Policy issued on November 5, 1976. The issue was whether using the revised values set forth in NUREG-0116 would tilt the cost-benefit balance against the issuance of the license.

121. The Applicant's direct case consisted of the testimony of Dr. Joseph A. Lieberman, Consultant, Nuclear Safety Associates (Lieberman, following Tr. 6546). The NRC Staff presented a panel of witnesses consisting of F. J. Miraglia, O. D. T. Lynch, Jr., and John R. Young, in support of a document entitled NRC Staff Evaluation of the Impact of Revised Table S-3 Values on the Cost-Benefit Balance, which was received into the record (Tr. 6583). Mr. Miraglia was co-editor of NUREG-0116 (Tr. 6586) which was used by Mr. Lynch as a basic source document for the preparation of the Staff evaluation (Tr. 6584). Mr. Young, who has had cost-benefit responsibility in these proceedings (Tr. 6586), stated that he had reviewed the NRC evaluation prepared by Mr. Lynch and agreed with the conclusion stated therein that if one considered the values set forth in revised Table S-3 as environmental impacts that they would not adversely tip the cost-benefit balance (Tr. 6587).

122. Both the Applicant and the Staff set forth in their evaluation the added environmental impact that would be assumed from the use of the values set forth in Revised Table S-3. There are insignificant increases in the number of acres of land temporarily committed and in millions of gallons of water used. There are insignificant increases in nonradiological effluents and in radiological releases. The Board finds the Applicant's evidence to be consistent with the Staff's. Any increases in adverse environmental impacts that would result from using the values in Revised Table S-3 are not significant and clearly do not tilt the cost-benefit balance.

123. On March 7, 1977, the Commission announced the adoption of an Interim Fuel Cycle Rule (42 *Fed. Reg.* 13803, March 14, 1977). The Interim Rule as adopted provides that pending cases such as this, in which the evidentiary record on fuel cycle impact has been compiled, are to be decided on the basis of the existing record. Therefore, the preceding conclusions are unaffected by the adoption of the Interim Rule.

124. In accordance with the October 8, 1976, decision of the Court of Appeals (*NRDC* v. *NRC*) discussed above, any license granted between July 21, 1976, and such time when the mandate is issued will be subject to the outcome of the proceedings in *NRDC* v. *NRC*.

XII. FINANCIAL QUALIFICATIONS

125. The Staff's initial analysis of the Applicant's financial ability to design and construct the St. Lucie Unit No. 2 facility appeared in the Safety Evaluation Report. Additional analyses were presented in Supplement No. 1 of the Safety Evaluation Report and in the affidavit of Staff witness Jim C. Petersen, dated

May 10, 1976. Each of these analyses enabled the Staff to conclude that the Applicant is financially qualified to design and construct the proposed facility.

126. On or about January 6, 1977, the Staff was made aware of a substantial change in the Applicant's estimated cost of construction. Thus, a further analysis of the Applicant's financial ability was performed by the Staff and the results of that analysis have been made available to the Board and parties by a further affidavit of Staff witness Petersen, this one dated February 7, 1977.[2] The current estimate of the total costs of St. Lucie Unit No. 2 is as follows:

	(dollars in millions)
Nuclear production plant costs	$850.0
Switchyard	0.8
Nuclear fuel inventory cost for first core	61.0
Total Estimated Cost	$911.8

127. Florida Power & Light Company is an investor-owned utility supplying electricity to residential, commercial and other customers. It serves most of the territory along the east and lower west coasts of Florida, an area around Lake Okeechobee, and portions of central and north central Florida. Consolidated operating revenues for the 12 months ended November 30, 1976, were $1,191.6 million and consolidated net income was $127.8 million. Invested capital on November 30, 1976, amounted to $3,246.5 million and consisted of 55.2 percent long-term debt, 10.4 percent preferred stock and 34.4 percent common equity. The Company's first mortgage bonds are rated A, upper medium grade, by both Moody's and Standard and Poor's. Florida Power & Light plans to finance the design and construction costs of St. Lucie Unit No. 2 through internally generated funds, external sales of debt and equity securities, and short-term borrowings. Available funds from these sources in 1975, after debt payments and retirements of $179 million, totaled $428 million. The internally generated funds of $162 million represented 36 percent of 1975 construction expenditures.

128. On the basis of its most recent analysis of the Applicant's financial ability, the Staff adheres to its original conclusion that the Applicant is financially qualified to design and construct St. Lucie Nuclear Plant, Unit No. 2. That conclusion rests upon Staff's determination that the Applicant has reasonable assurance of obtaining the necessary funds. Based upon all the evidence of record, the Board agrees with this conclusion.

[2] The referenced affidavit is hereby received in evidence in this proceeding as Staff Exhibit S-11.

XIII. TECHNICAL QUALIFICATIONS

129. The PSAR describes the Applicant's training programs, organization, and personnel qualifications (Applicant's Exhibit 2-F, Section 13). Applicant has two nuclear units in operation at its Turkey Point site. The training programs for engineering and operating personnel at Turkey Point has been expanded and continued as required to train personnel for the St. Lucie plant (Applicant's Exhibit 1, p. 5; SER, p. 13-3).

130. The Staff has reviewed the organization and personnel qualifications proposed by the Applicant for the St. Lucie plant, including the operating staff for Unit No. 2, and has concluded that the Applicant is technically qualified to design and construct the plant (SER, pp. 13-3, 21-2; SER Supp. No. 1, p. 21-1). The Board agrees.

XIV. COMMON DEFENSE AND SECURITY

131. The activities to be conducted under the construction permit will be conducted within the jurisdiction of the United States (Applicant's Exhibit 1, p. 3). Applicant is an electric utility doing business in the State of Florida (Applicant's Exhibit 1, p. 1). It is not owned, controlled or dominated by an alien, a foreign corporation or a foreign government, and is not acting as an agent or representative of any other persons in making the application (Applicant's Exhibit 1, p. 2). Applicant has agreed not to disclose Restricted Data to any individual, unless the Commission has determined that such disclosure will not endanger the common defense and security (Applicant's Exhibit 1, p. 8).

XV. CONCLUSIONS OF LAW

132. The Board has reviewed the entire record of this proceeding. The application and the proceedings thereon comply with the requirements of the Atomic Energy Act of 1954, as amended, the National Environmental Policy Act of 1969, and the rules and regulations of the Commission. The Board finds that the Staff's NEPA review has been adequate and that NEPA, Section 401 of the Federal Water Pollution Control Act, and Appendix D to 10 CFR Part 50 have been complied with.

The Board concludes that:

A. In accordance with the provision of 10 CFR Section 50.35(a);

1. The Applicant has described the proposed design of the facility, including, but not limited to, the principal architectural and engineering criteria for the design, and has identified the major features or components incorporated therein for the protection of the health and safety of the public;

2. Such further technical or design information as may be required to complete the safety analysis, and which can reasonably be left for later consideration, will be supplied in the final safety analysis report;
3. Safety features or components, which require research and development have been described by the Applicant; and the Applicant has identified, and there will be conducted, a research and development program reasonably designed to resolve any safety question associated with such features and components; and
4. On the basis of the foregoing, there is reasonable assurance that (i) such safety questions will be satisfactorily resolved at or before the latest date stated in the application for completion of construction of the proposed facility, and (ii) taking into consideration the site criteria contained in 10 CFR Part 100, the proposed location without undue risk to the health and safety of the public.

B. The Applicant is technically qualified to design and construct the proposed facility.
C. The Applicant is financially qualified to design and construct the proposed facility.
D. The issuance of permits for construction of the facility will not be inimical to the common defense and security or to the health and safety of the public.
E. The environmental review performed by the Staff (pursuant to the National Environmental Policy Act of 1969) and the Final Environmental Statement, as modified by this Initial Decision, are adequate.
F. Sections 102(2)(A), (C) and (D) of NEPA and Appendix D (10 CFR Part 50) have been complied with.
G. The Board has considered the final balance among conflicting environmental factors, and has weighed the various benefits against costs, taking account of the need for power, and the alternatives to the plant and its design features. The Board concludes that these considerations favor the issuance of a construction permit for the facility, conditioned as set out below.

XVI. ORDER

On the basis of the Board's findings and conclusions in its Partial Initial Decision, the Supplement to the Partial Initial Decision, and this Initial Decision, and pursuant to the Atomic Energy Act of 1954, as amended, and the Commission's rules and retulations, IT IS ORDERED that the Office of Nuclear Reactor Regulation is authorized to issue to Florida Power and Light Company a

permit to construct St. Lucie Nuclear Power Plant, Unit No. 2, consistent with the terms of this Initial Decision, the Partial Initial Decision and the Supplement to the Partial Initial Decision, and the following listed conditions:

1. The Applicant shall monitor the actual location of domesticated cows and goats during plant operation, at time intervals to be specified by the Staff, for the purpose of continuing appraisal of population doses (1 NRC 101, 157, para. 126(b)).
2. The Applicant shall provide erosion protection for the nose of the discharge canal, the design of which must be submitted to the Staff for review and approval prior to construction (SER 2.4.2; SER Supp. No. 1, §2.4.2.6, para. 4).
3. The Applicant shall provide erosion protection for the Ultimate Heat Sink barrier wall in the form of sheetpile bulkheads and groins (SER Supp. No. 1, §2.4.2.5(2)).
4. The Applicant will undertake the additional engineered safety features (ESF) required to reduce offsite doses to values below the guideline of 10 CFR Part 100 at a distance of one (1) mile, as specified in paragraph 83 of the Board's Partial Initial Decision (1 NRC 101, 137-38), dated February 28, 1975 (1 NRC 101, 157, para. 126(e)).
5. The Applicant shall improve the in situ soils as recommended by the Staff so that the canal barrier and the slopes between the canal barrier and the plant will not fail (1 NRC 101, 157, para. 126(f)).
6. The Applicant shall monitor actual fish entrapment in the intake canal and otherwise comply with the Staff recommendation as set forth at FES 4.5.2(2) (1 NRC 101, 157, para. 126(g)).
7. The Applicant shall comply with the Staff recommendation regarding the operation of discharge lines as set forth in paragraph 102 of the Board's Partial Initial Decision (1 NRC 101, 146), dated February 28, 1975 (1 NRC 101, 157, para. 126(h)).
8. The Applicant shall not draw more than four (4) million gallons of water per year from Big Mud Creek for routine testing (1 NRC 101, 157, para. 126(i)).
9. The Applicant shall monitor chlorine and chlorine residuals as recommended by the Staff and set forth at FES 5.2.3 (1 NRC 101, 157, para. 126(j)).
10. The Applicant shall monitor the thermal field after Unit No. 1 is operational as set forth in paragraph 110 of the Board's Partial Initial Decision, (1 NRC 101, 149) dated February 28, 1975 (1 NRC 101, 157, para. 126(k)).
11. The Applicant shall continue the turtle nest surveys and studies to determine any plant impact thereon. The Applicant shall deliver

such studies and survey data to the Staff and shall undertake to promptly publish the data and conclusions therefrom (1 NRC 101, 157, para. 126(l)).

12. The Applicant shall undertake the preoperational and operational monitoring program as approved with conditions and recommendations by the Staff (1 NRC 101, 157, para. 126(m)).

IT IS FURTHER ORDERED, in accordance with 10 CFR Sections 2.760, 2.762, 2.764, 2.785 and 2.786 that this Initial Decision shall become effective immediately and shall constitute, with respect to the matters covered therein, the final action of the Commission forty-five (45) days after the date of issuance hereof, subject to any review pursuant to the Commission's Rules of Practice. Exceptions to this Initial Decision may be filed by any party within seven (7) days after service of this Initial Decision. Within fifteen (15) days thereafter (twenty (20) in the case of the Staff) any party filing such exceptions shall file a brief in support thereof. Within fifteen (15) days of the filing of the brief of the Appellant (twenty (20) days in the case of the Staff), any other party may file a brief in support of, or in opposition to, the exceptions.

THE ATOMIC SAFETY AND
LICENSING BOARD

Edward Luton, Chairman

David L. Hetrick, Member

Frank F. Hooper, Member

Dated at Bethesda, Maryland
this 19th day of April 1977.

Cite as 5 NRC 1435 (1977) ALAB-415

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Michael C. Farrar, Chairman
Richard S. Salzman
Dr. W. Reed Johnson

In the Matter of Docket No. 50-389

FLORIDA POWER & LIGHT COMPANY

(St. Lucie Nuclear Power Plant,
Unit No. 2) June 28, 1977

Upon intervenors' motion for a stay pending appeal of the Licensing Board's initial decision authorizing issuance of a construction permit, LBP-77-27, 5 NRC 1038 (1977), the Appeal Board holds that under the standards of *Virginia Petroleum Jobbers Assn* v. *FPC*, 259 F.2d 921, 925 (D.C. Cir. 1958), a stay is not warranted.

Motion denied

RULES OF PRACTICE: STAY PENDING APPEAL

In Commission proceedings the criteria laid down in *Virginia Jobbers Assn* v. *FPC*, 259 F.2d 921, 925 (D.C. Cir. 1958), govern disposition of motions seeking a stay pending appeeal. These criteria are formally incorporated into the Commission's Rules of Practice, 10 CFR §2.788(e), effective June 1, 1977, 42 Fed. Reg. 22128.

RULES OF PRACTICE: STAY PENDING APPEAL

Where the movant has failed to establish irreparable harm, he must make a compelling showing on the other three factors in 10 CFR §2.788(e) in order to obtain a stay pending appeal.

Mr. Harold F. Reis, Washington, D.C. (with whom Mr. Norman A. Coll, Miami, Florida was on the brief), for the applicant, Florida Power & Light Company.

Mr. Martin Harold Hodder, Miami, Florida, *pro se* and as counsel for Rowena E. Roberts, *et al.*, intervenors.

Mr. William J. Olmstead (with whom **Mr. William D. Paton** was on the brief) for the Nuclear Regulatory Commission staff.

MEMORANDUM AND ORDER

In ALAB-404, 5 NRC 1185 (May 31, 1977), we established a schedule for briefing and oral argument on the intervenors' motion for a stay pending appeal of the effectiveness of the initial decision of the Licensing Board authorizing the issuance of a construction permit for Unit 2 of the St. Lucie nuclear facility.[1] Having now fully considered the positions of the respective parties as developed in their papers and at argument, we conclude that a stay is not warranted under the standards laid down in *Virginia Petroleum Jobbers Ass'n.* v. *Federal Power Commission*, 259 F.2d 921, 925 (D.C. Cir. 1958). As observed in ALAB-404, 5 NRC at 1187, fn. 4, those standards have been customarily applied by us in acting upon stay motions. Beyond that, the Commission has just formally incorporated them into the Rules of Practice. 10 CFR §2.788(e), effective June 1, 1977, 42 Fed. Reg. 22128, 22130.[2] See *Kansas Gas and Electric Co.* (Wolf Creek Generating Station, Unit No. 1), ALAB-412, 5 NRC 1415, 1416 (June 15, 1977).

At oral argument, intervenors acknowledged with commendable candor that "the amount of work the applicant seeks to do in the next few months" would have an "insignificant [environmental] effect" (App. Tr. 8).[3] Rather, their claim of irreparable injury was bottomed entirely on the possibility that construction undertaken by the applicant while the appeal is before us would prove sufficient of itself to tilt the environmental cost-benefit balance in favor of allowing the

[1] LBP-77-27, 5 NRC 1038 (April 19, 1977). ALAB-404 also denied intervenors' request for an immediate emergency stay.

[2] Section 2.788(e) provides that

> . . . In determining whether to grant or deny an application for a stay, the Commission, Atomic Safety and Licensing Appeal Board, or presiding officer will consider:
>
> (1) Whether the moving party has made a strong showing that it is likely to prevail on the merits;
>
> (2) Whether the party will be irreparably injured unless a stay is granted;
>
> (3) Whether the granting of a stay would harm other parties and
>
> (4) Where the public interest lies.

[3] In this connection, intervenors' counsel noted, as had we in ALAB-404, 5 NRC at 1187, that the site is not a virgin one.

plant to be completed. *Ibid.*[4] But our review of the record and our understanding of the nature and amount of work likely to be completed in the next few months satisfies us that in no event could that work significantly affect our ultimate decision on the appeal. In this circumstance, to justify a stay the intervenors must be found to have made an especially compelling showing on the other three factors. *Public Service Co. of New Hampshire* (Seabrook Station, Units 1 and 2), ALAB-338, NRCI-76/7 10, 14-15 (1976). Without implying that the Licensing Board's decision will ultimately be affirmed by us, it must be accorded presumptive correctness at this stage for the intervenors have not demonstrated that there is a particularly strong probability that their appeal will be successful. Nor have they persuaded us that the two remaining factors—the public interest and the absence of a likelihood of injury to others—weigh heavily in favor of granting a stay. See ALAB-404, *supra*.

The motion for a stay is *denied*.
It is so ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING APPEAL BOARD

Margaret E. Du Flo.
Secretary to the Appeal Board

[4] Intervenors' appeal raises, *inter alia*, the question whether adequate consideration was given to alternative sites for Unit 2.

Cite as 6 NRC 541 (1977) ALAB-435

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING APPEAL BOARD

Michael C. Farrar, Chairman
Richard S. Salzman
Dr. W. Reed Johnson

In the Matter of Docket No. 50-389

FLORIDA POWER & LIGHT COMPANY

(St. Lucie Nuclear Power Plant, Unit No. 2) October 7, 1977

Upon appeal by intervenors from the Licensing Board's initial decision (LBP-77-27, 5 NRC 1038 (1977)), the Appeal Board upholds the determination below that the staff's NEPA review of alternative sites was adequate, taking into account the procedures followed both before and after its methodology was questioned. Upon *sua sponte* review of other aspects of the initial decision, the Appeal Board directs the applicant to provide a memorandum setting forth information relevant to steam generator tube integrity.

Initial decision affirmed, subject to outcome of further examination into issue of steam generator tube integrity, over which jurisdiction is retained.

NEPA: CONSIDERATION OF ALTERNATIVES

An applicant's selection of a site may be rejected on the ground that a preferable alternative exists only if the alternative is "obviously superior."

RULES OF PRACTICE: PROPRIETARY DATA

If a licensing board (or an intervenor with a pertinent contention) wishes to review data claimed by an applicant to be proprietary, it has a right to do so (albeit under a protective order if necessary). 10 CFR §2.790(b)(6); *Commonwealth Edison Co.* (Zion, Units 1 and 2), ALAB-196, 7 AEC 457, 469 (1974).

Messrs. Harold F. Reis, Washington, D.C., and **Norman A. Coll**, Miami, Florida, for the applicant, Florida Power & Light Company.

Mr. Martin Harold Hodder, Miami, Florida, *pro se* and as counsel for intervenors Rowena E. Roberts, *et al.*

Messrs. William J. Olmstead and **William D. Paton** for the Nuclear Regulatory Commission staff.

DECISION

We have before us the Licensing Board's initial decision authorizing the construction by the applicant of a second nuclear unit at the St. Lucie site on Florida's east coast.[1] That decision resolves all the issues the Board had left open in an earlier partial initial decision.[2] It also contains the Board's conclusions on the intervenors' alternative site contention, which had been summarily dismissed early in the proceeding but was reinstated by us on the basis of information which came to light when the case reached us the first time.[3]

The intervenors have taken an appeal. Although their exceptions cover a number of topics, they abandoned many by failing to brief them.[4] Of those that they have pursued, the alternative site matter has received their primary attention. We discuss it in Part A below.[5] We then turn in Part B to a topic not raised by the intervenors but which our own customary review of the entire record has revealed to warrant discussion, *viz.*, steam generator tube integrity.

A. Alternative Sites. The Commission has held that an applicant's selection of a site may be rejected on the ground that a preferable alternative ex-

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[1] LBP-77-27, 5 NRC 1038 (April 19, 1977).

[2] LBP-75-5, 1 NRC 101 (1975), as supplemented by LBP-75-25, 1 NRC 463 (1975).

[3] ALAB-335, 3 NRC 830 (1976).

[4] See, *e.g.*, *Union Electric Co.* (Callaway, Units 1 and 2), ALAB-347, 4 NRC 216 (1976). In order to assure that the failure to include a discussion of certain exceptions in their brief was not due solely to time constraints, we afforded the intervenors an opportunity to take additional time to supplement their brief (see June 8, 1977, App. Bd. Tr. 125-29). Certain exceptions remained unbriefed even in the supplement that was filed.

[5] The other arguments which the intervenors have presented to us are essentially the same ones presented to the Licensing Board and fully considered and rejected by it. We concur in its disposition of the issues addressed in those arguments.

ists only if the alternative is "obviously superior."[6] In this connection, although the intervenors do argue that a preferable site exists, their principal contention is that the procedures which the staff followed in conducting its alternative site review fell far short of what the National Environmental Policy Act requires.

Since hearing oral argument on the intervenors' motion for a stay of construction pending appeal,[7] we have reviewed the entire record with some care. We are convinced that the Licensing Board dealt with the alternative site question in thorough and comprehensive fashion. With respect to the intervenors' primary assertion, that Board ultimately found the staff's alternative site review to have been adequate, taking into account what was done in the periods both before and after the staff's methodology was first called into serious question.[8] But the Board reached that conclusion only after it had conducted a searching and critical analysis of the staff's procedures; indeed, it held that the staff's early efforts, standing alone, were inadequate. We adopt as our own the essence of the Board's well reasoned opinion and add but two brief comments.

1. The National Environmental Policy Act requires the staff to examine a wide range of possible impacts of a nuclear facility and, in that regard, to inquire into whether there exist alternatives of one kind or another that would mitigate those impacts. In that connection, we said earlier in this case that perhaps the most important environmentally related task the staff has is to determine whether an application should be turned down because there is some other site at which the plant ought to be located.[9] No other environmental question is both so significant in terms of the ultimate outcome and so dependent upon facts particular to the application under scrutiny.

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[6] *Public Service Co. of New Hampshire* (Seabrook, Units 1 and 2), CLI-77-8, 5 NRC 503, 526-36 (1977). As the Commission there explained, when a remand follows an earlier approval of construction activity, the comparison between alternatives is to be made as of the time the new decision is made—thereby giving the site selected by the applicant the benefit of any time and money previously expended—unless there has been a lack of integrity in the NEPA process. 5 NRC at 532-33. Here it does not matter at what point subsequent to the institution of the Unit 2 proceeding the comparison is drawn. For as it turns out, the work which tipped the balance in favor of the *St. Lucie* site occurred during the construction of the first unit on the site. Any time and money arguably misspent (see 5 NRC at 533) in the period between the Licensing Board's first decision on Unit 2 and the Court of Appeals' stay of that decision was essentially inconsequential.

[7] We denied the requested stay for the reasons assigned in ALAB-415, 5 NRC 1435 (June 28, 1977). Much of the oral argument on the stay focused on whether the intervenors were likely to prevail on the merits. After receipt of the parties' full briefs on the appeals, we decided that additional oral argument on the merits would not be necessary.

[8] See fn. 3, *supra*.

[9] See ALAB-335, *supra*, 3 NRC at 840.

Consequently, we would expect the staff to take unusual care in performing its analysis and in disclosing the results of its work to the public.

We regret the necessity of having to state that the record of this case does not instill confidence in us that the staff always acts with that degree of care which would demonstrate its commitment to the vigorous enforcement of NEPA's commands regarding alternate site inquiries.[10] At different times in this proceeding, the staff appeared to treat compliance with NEPA as a hurdle in the path of, rather than a prerequisite to, the issuance of a nuclear power plant license. Manifestly, the staff's attitude toward environmental questions should be parallel to its generally commendable stance in the safety area. There, the staff quite properly treats an applicant's statements as those of a decidedly interested party. Accordingly, the staff reviews them with a trained, dispassionate and skeptical eye. Where the environment is concerned, the same sort of review should be the norm.

Lest we be misunderstood, we harbor no bias for or against any particular outcome of the staff's review of environmental matters. But a staff conclusion that an applicant's proposal passes muster is valuable only to the extent it represents the results of vigorous probing for possible shortcomings. Where that has been done, there is much more reason to trust the validity of the conclusion.[11]

2. Our second comment is related to the first. There was need here for careful probing of the staff's efforts, and the intervenors helped initiate and conduct that probe. Thus, although they did not achieve the ultimate result they desired, the intervenors clearly assisted in the search for truth. The contribution they made should not pass unnoticed.

B. Steam Generator Tube Integrity. Our review *sua sponte* of the other aspects of the inital decision and the record has disclosed one matter which requires further attention.[12] In another proceeding, we recently completed a

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[10] As appears to be customary, in this case much of the work was done not by regular staff employees but by consultants it retained. The staff, of course, bears full responsibility whether it chooses to do the work itself or through outside consultants.

[11] There is nothing startling about this message. That it ought to have been unnecessary to convey it is confirmed by the fact that a similar thought appears in the applicant's brief. In their urging us to affirm the Licensing Board's decision, that applicant placed emphasis on the fact that the Board below had come to its decision only after conducting a most searching and skeptical inquiry: "Here the Board was manifestly critical of the Staff and clearly had no predisposition to a particular conclusion. [Citations omitted.] With this attitude, the Licensing Board's ultimate acceptance of the testimony and conclusions of the Staff provides additional assurance of their validity." Applicant's Brief, p. 44.

[12] In addition, an observation is in order with respect to the procedure followed in looking into the applicant's financial qualifications. When the staff completed the last-minute reexamina-

(continued next page)

prolonged, in-depth consideration of questions relating to the integrity, or soundness, of the steam generator tubes in pressurized water reactors. See *Northern States Power Co.* (Prairie Island, Units 1 and 2), ALAB-343, 4 NRC 169 (1976), and ALAB-427, 6 NRC 212 (August 15, 1977). This subject was not put in issue below, nor did the Licensing Board have occasion to discuss it. It may have believed this course to be justified because the applicant has proposed to utilize "all volatile" secondary water treatment (AVT) at St. Lucie 2, rather than the "phosphate" method which had earlier been in vogue.[13] The AVT method had been found to offer reasonable assurance that there will be no tube corrosion.[14] Moreover, it was expected to protect against the recently encountered "tube denting" phenomenon[15] which has been particularly prevalent at plants, like St. Lucie, that are designed to use salt water for condenser cooling. For tube denting had been considered to be a consequence of the use of the phosphate method of secondary water treatment, which, as noted above, St. Lucie 2 will not employ.

It is no longer possible to be so sanguine about the matter. For, subsequent to the decision of the Board below, new information was brought to our attention in *Prairie Island.* The existence of steam generator tube denting now has been reported at two seawater-cooled nuclear plants which have used only the AVT method of secondary water treatment from the beginning of their operation (*i.e.,* they did not switch over after a prior use of phosphates). See ALAB-427, *supra,* 6 NRC at 216-218, fn. 7 and accompanying text.[16] Both of the affected plants, like St. Lucie, are of the Combustion Engineering Company design.

(continued from preceeding page)

tion prompted by the dramatic increase in the projected cost of the facility (see Tr. 6617-18, 6630), it submitted to the Board an expurgated version of the applicant's "source of funds" sheet. See the February 7, 1977, affidavit and accompanying documents later admitted into evidence as Staff Exhibit S-11 (5 NRC at 1076, fn. 2 and accompanying text.) Its stated reason for doing so was that the applicant claimed that the deleted figures were proprietary. Of course, had the Board or the intervenors wished to review the figures, they would have had the right to do so (albeit under a protective order if necessary), regardless of the proprietary claims. See 10 CFR §2.790(b)(6); see also *Commonwealth Edison Co.* (Zion, Units 1 and 2), ALAB-196, 7 AEC 457, 469 (1974).

[13] See Amendment #39 to the Preliminary Safety Analysis Report (September 26, 1975), p. 10.3-6a.

[14] ALAB-343, *supra,* 4 NRC at 199.

[15] "Tube denting" refers to the pinching of tubes caused by the growth of corrosion products in the crevices between the tubes and their support plates.

[16] Additionally, the formation of porous magnetite, the precursor of denting, has been demonstrated in the laboratory under conditins simulating a steam generator operating under AVT with some chloride present. L.J. Martel, *et al.,* "EPRI Steam Generator Programs," American Power Conference, Chicago, Illinois, April 18-20, 1977.

Nothing presently in this record would allow us to disregard this experience, which portends the likelihood of steam generator tube denting at St. Lucie. Because of the potential safety problems associated with that phenomenon, we must explore it further. Accordingly, with respect to St. Lucie, Unit 2, we direct the applicant to provide us and the other parties by November 4, 1977, with a memorandum containing a full, current description of (1) the steam generators; (2) the components of the condensate and feedwater systems; and (3) the method by which the secondary cooling water is to be treated. In each instance, the submission should emphasize those aspects of the plant's design and operating procedures which will be directed toward avoidance of steam generator sludge formation, tube corrosion and denting; and the provisions, if any, which are being made to cope with denting should it nevertheless occur.[17] Any other party may file a responsive memorandum by November 30, 1977.

For the foregoing reasons, the Licensing Board's authorization of the issuance of a construction permit for St. Lucie 2 is *affirmed,* subject to the outcome of our further examination into the issue of steam generator tube integrity, over which we are retaining jurisdiction.[18]

It is so ORDERED.

FOR THE ATOMIC SAFETY AND
LICENSING APPEAL BOARD

Eleanor E. Hagins
Secretary to the Appeal Board

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[17] In this connection, see also our unpublished order of August 19, 1977, calling for additional information in *Public Service Co. of New Hampshire* (Seabrook, Units 1 and 2), Docket Nos. 50-443 and 50-444. (A copy of that order is being sent to the parties along with this opinion.) As we there recognized, this type of information normally need not be supplied by (and may not even be available to) an applicant at the construction permit stage. However, here, as there, it will be useful to us to have all the information currently available.

[18] For reasons previously elaborated elsewhere, construction may proceed in the interim. See *Public Service Co. of New Hampshire* (Seabrook, Units 1 and 2), ALAB-422, 6 NRC 33, 105 (July 26, 1977) (Commission review pending on other grounds, CLI-77-22, 6 NRC 451, September 15, 1977).

[10 CFR Part 50]
LICENSING OF PRODUCTION AND UTILIZATION FACILITIES

Consideration of Accidents in Implementation of the National Environmental Policy Act of 1969

The Atomic Energy Commission has under consideration amendments to Appendix D of its regulation 10 CFR Part 50, Licensing of Production and Utilization Facilities, an "Interim Statement of General Policy and Procedure: Implementation of the National Environmental Policy Act of 1969 (Public Law 91-190)." The proposed amendments would, by the addition of an annex to Appendix D, specify certain standardized accident assumptions to be used in Environmental Reports submitted by applicants for construction permits or operating licenses for nuclear power reactors pursuant to Appendix D.[1] The accident assumptions and other provisions of the proposed amendments would also be applicable to AEC draft and final Detailed Statements.

The Commission invites written comments or suggestions from all interested persons on the proposed amendments set forth below as well as on the treatment of the probabilities of the accidents.

The Commission expects that the provisions of the proposed amendments will be useful as interim guidance until such time as the Commission takes further action on them.

[1] In conjunction with the revision of Appendix D on Sept. 9, 1971 (36 F.R. 18071), there was transmitted to applicants for licenses to construct or operate nuclear power plants, and made available to the public, a document dated Sept. 1, 1971, entitled "Scope of Applicant's Environmental Reports with Respect to Transportation, Transmission Lines and Accidents." This document was a supplement to the guidance provided to license applicants in the "Draft AEC Guide to the Preparation of Environmental Reports for Nuclear Power Plants," dated Feb. 19, 1971, also made available to the public.

Pursuant to the Atomic Energy Act of 1954, as amended, and section 553 of title 5 of the United States Code, notice is hereby given that adoption of the following amendments to 10 CFR Part 50 is contemplated. All interested persons who desire to submit written comments or suggestions for consideration in connection with the proposed amendments should send them to the Secretary of the Commission, U.S. Atomic Energy Commission, Washington, D.C. 20545, Attention: Chief, Public Proceedings Branch, within 30 days after publication of this notice in the Federal Register. Copies of comments received may be examined in the Commission's Public Document Room, 1717 H Street NW., Washington, D.C.

1. A sentence is added at the end of paragraph 4, of section A of Appendix D to read as follows:

APPENDIX D — INTERIM STATEMENT OF GENERAL POLICY AND PROCEDURE: IMPLEMENTATION OF THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 (PUBLIC LAW 91-190)

* * * * *

A. *Basic procedures.*

* * * * *

4. * * * The Environmental Report required by paragraph 1 shall also include a discussion of accidents, based on the assumptions set forth in the annex to this appendix.

* * * * *

2. An annex is added to Appendix D to read as follows:

ANNEX

DISCUSSION OF ACCIDENTS IN APPLICANTS' ENVIRONMENTAL REPORTS: ASSUMPTIONS

This Annex requires certain assumptions to be made in discussion of accidents in Environmental Reports sub-

mitted pursuant to Appendix D by applicants[1] for construction permits or operating licenses for nuclear power reactors.[2]

Postulated accidents are discussed in another context in applicants' safety analysis reports. The principal line of defense is accident prevention through correct design, manufacture, and operation, and a quality assurance program is used to provide and maintain the necessary high integrity of the reactor system. Deviations that may occur are handled by protective systems to place and hold the plant in a safe condition. Notwithstanding all this, the conservative postulate is made that serious accidents might occur, in spite of the fact that they are extremely unlikely, and engineered safety features are installed to mitigate the consequences of these unlikely postulated events.

In the consideration of the environmental risks associated with the postulated accidents, the probabilities of their occurrence and their consequences must both be taken into account. Since it is not practicable to consider all possible accidents, the spectrum of accidents, ranging in severity from trival to very serious, is divided into classes.

Each class can be characterized by an occurrence rate and a set of consequences.

Standardized examples of classes of accidents to be considered by applicants in preparing the section of Environmental Reports dealing with accidents are set out in

[1]Although this annex refers to applicants' Environmental Reports, the current assumptions and other provisions thereof are applicable, except as the content may otherwise require, to AEC draft and final Detailed Statements.

[2]Preliminary guidance as to the content of applicants' Environmental Reports was provided in the Draft AEC Guide to the Preparation of Environmental Reports for Nuclear Power Plants dated Feb. 19, 1971, a document made available to the public as well as to the applicant. Guidance concerning the discussion of accidents in environmental reports was provided to applicants in a Sept. 1, 1971, document entitled "Scope of Applicants' Environmental Reports with Respect to Transportation, Transmission Lines and Accidents," also made available to the public.

tabular form below. The spectrum of accidents, from the most trivial to the most severe, is divided into nine classes, some of which have sub-classes. The accidents stated in each of the eight classes in tabular form below are representative of the type of accidents that must be analyzed by the applicant in Environmental Reports; however, other accident assumptions may be more suitable for individual cases. Where assumptions are not specified, or where those specified are deemed unsuitable, assumptions as realistic as the state of knowledge permits shall be used, taking into account the specific design and operational characteristics of the plant under consideration.

For each class, except Classes 1 and 9, the environmental consequences shall be evaluated as indicated. Those classes of accidents, other than Classes 1 and 9, found to have significant adverse environmental effects shall be evaluated as to probability, or frequency of occurrence, to permit estimates to be made of environmental risk or cost arising from accidents of the given class.

Class 1 events need not be considered because of their trivial consequences.

Class 8 events are those considered in safety analysis reports and AEC staff safety evaluations. They are used, together with highly conservative assumptions, as the design-basis events to establish the performance requirements of engineered safety features. The highly conservative assumptions and calculations used in AEC safety evaluations are not suitable for environmental risk evaluation, because their use would result in a substantial overestimate of the environmental risk. For this reason, Class 8 events shall be evaluated realistically. Consequences predicted in this way will be far less severe than those given for the same events in safety analysis reports where more conservative evaluations are used.

The occurrences in Class 9 involve sequences of postulated successive failures more severe than those postulated for the design basis for protective systems and engineered safety features. Their consequences could be

severe. However, the probability of their occurrence is so small that their environmental risk is extremely low. Defense in depth (multiple physical barriers), quality assurance for design, manufacture, and operation, continued surveillance and testing, and conservative design are all applied to provide and maintain the required high degree of assurance that potential accidents in this class are, and will remain, sufficiently remote in probability that the environmental risk is extremely low. For these reasons, it is not necessary to discuss such events in applicants' Environmental Reports.

Furthermore, it is not necessary to take into account those Class 8 accidents for which the applicant can demonstrate that the probability has been reduced and thereby the calculated risk to the environment made equivalent to that which might be hypothesized for a Class 9 event.

Applicants may substitute other accident class breakdowns and alternative values of radioactive material releases and analytical assumptions, if such substitution is justified in the Environmental Report.

ACCIDENT ASSUMPTIONS

TABLE OF CONTENTS

Accident
1.0 Trivial incidents.
2.0 Small release outside containment.
3.0 Radwaste system failures.
  3.1 Equipment leakage or malfunction.
  3.2 Release of waste gas storage tank contents.
  3.3 Release of liquid waste storage tank contents.
4.0 Fission products to primary system (BWR)
  4.1 Fuel cladding defects.
  4.2 Off-design transients that induce fuel failures above those expected.
5.0 Fission products to primary and secondary systems (PWR).
  5.1 Fuel cladding defects and steam generator leaks.
  5.2 Off-design transients that induce fuel failure above those expected and steam generator leak.

  5.3 Steam generator tube rupture.
6.0 Refueling accidents.
  6.1 Fuel bundle drop.
  6.2 Heavy object drop onto fuel in core.
7.0 Spent fuel handling accident.
  7.1 Fuel assembly drop in fuel storage pool.
  7.2 Heavy object drop onto fuel rack.
  7.3 Fuel cask drop.
8.0 Accident initiation events considered in design basis evaluation in the safety analysis report.
  8.1 Loss-of-coolant accidents.
  8.1(a) Break in instrument line from primary system that penetrates the containment.
  8.2(a) Rod ejection accident (PWR).
  8.2(b) Rod drop accident (BWR).
  8.3(a) Steamline breaks (PWRs outside containment).
  8.3(b) Steamline breaks (BWR).

ACCIDENT ASSUMPTIONS

ACCIDENT — 1.0 TRIVIAL INCIDENTS

These incidents shall be included and evaluated under routine releases in accordance with proposed Appendix I.[1]

ACCIDENT — 2.0 SMALL RELEASE OUTSIDE CONTAINMENT

These releases shall include such things as releases through steamline relief valves and small spills and leaks of radioactive materials outside containment. These releases shall be included and evaluated under routine releases in accordance with proposed Appendix I.

ACCIDENT — 3.0 RADWASTE SYSTEM FAILURE

3.1. *Equipment leakage or malfunction* (includes operator error).

(a) Radioactive gases and liquids: 25 percent of average inventory in the largest storage tank shall be assumed to be released.

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[1] 36 F.R. 11113, June 8, 1971.

(b) Meteorology assumptions — x/Q values are to be 1/10 of those given in AEC Safety Guide No. 3 or 4.[2]

(c) Consequences should be calculated by weighting the effects in different directions by the frequency the wind blows in each direction.

3.2 *Release of waste gas storage tank contents* (includes failure of release valve and rupture disks).

(a) 100 percent of the average tank inventory shall be assumed to be released.

(b) Meteorology assumptions — x/Q values shall be 1/10 of those given in AEC Safety Guide No. 3 or 4.

(c) Consequences should be calculated by weighting the effects in different directions by the frequency the wind blows in each direction.

3.3. *Release of liquid waste storage tank contents.*

(a) Radioactive liquids — 100 percent of the average storage tank inventory shall be assumed to be spilled on the floor of the building.

(b) Building structure shall be assumed to remain intact.

(c) Meteorology assumptions — x/Q values shall be 1/10 of those given in AEC Safety Guide No. 3 or 4.

(d) Consequences should be calculated by weighting the effects in different directions by the frequency the wind blows in each direction.

ACCIDENT — 4.0 FISSION PRODUCTS TO PRIMARY SYSTEM (BWR)

4.1. *Fuel cladding defects.*

Releases from these events shall be included and evaluated under routine releases in accordance with proposed Appendix I.

4.2 *Off-design transients that induce fuel failures above those expected* (such as flow blockage and flux maldistributions).

[2]Copies of such Guide(s), dated Nov. 2, 1970, are available at the Commission's Public Document Room, 1717 H Street NW, Washington, DC, and on request to the Director, Division of Reactor Standards, U.S. Atomic Energy Commission, Washington, D.C. 20545.

(a) 0.02 percent of the core inventory of noble gases and 0.02 percent of the core inventory of halogens shall be assumed to be released into the reactor coolant.

(b) 1 percent of the halogens in the reactor coolant shall be assumed to be released into the steam.

(c) The mechanical vacuum pump shall be assumed to be automatically isolated by a high radiation signal on the steamline.

(d) Radioactivity shall be assumed to carry over to the condenser where 10 percent of the halogens shall be assumed to be available for leakage from the condenser to the environment at 0.5 percent/day for the course of the accident (24 hours).

(e) Meteorology assumptions —x/Q values shall be 1/10 of those given in AEC Safety Guide No. 3 dated November 2, 1970.

(f) Consequences should be calculated by weighting the effects in different directions by the frequency the wind blows in each direction.

ACCIDENT — 5.0 FISSION PRODUCTS TO PRIMARY AND SECONDARY SYSTEMS (PRESSURIZED WATER REACTOR)

5.1 *Fuel cladding defects and steam generator leak.*

Releases from these events shall be included and evaluated under routine releases in accordance with proposed Appendix I.

5.2 *Off-design transients that induce fuel failure above those expected and steam generator leak* (such as flow blockage and flux maldistributions).

(a) 0.02 percent of the core inventory of noble gases and 0.02 percent of the core inventory of halogens shall be assumed to be released into the reactor coolant.

(b) Average inventory in the primary system prior to the transient shall be based on operation with 0.5 percent failed fuel.

(c) Secondary system equilibrium radioactivity prior to the transient shall be based on a 20 gal./day steam generator leak and a 10 g.p.m. blowdown rate.

(d) All noble gases and 0.1 percent of the halogens in the steam reaching the condenser shall be assumed to be released by the condenser air ejector.

(e) Meteorology assumptions — x/Q values shall be 1/10 of those given in AEC Safety Guide No. 4.

(f) Consequences should be calculated by weighting the effects in different directions by the frequency the wind blows in each direction.

5.3 *Steam generator tube rupture.*

(1) 15 percent of the average inventory of noble gases and halogens in the primary coolant shall be assumed to be released into the secondary coolant.

The average primary coolant activity shall be based on 0.5 percent failed fuel.

(b) Equilibrium radioactivity prior to rupture shall be based on a 20 gallon per day steam generator leak and a 10 g.p.m. blow-down rate.

(c) All noble gases and 0.1 percent of the halogens in the steam reaching the condenser shall be assumed to be released by the condenser air ejector.

(d) Meteorology assumptions — x/Q values shall be 1/10 of those given in AEC Safety Guide No. 4.

(e) Consequences should be calculated by weighting the effects in different directions by the frequency the wind blows in each direction.

ACCIDENT — 6.0 REFUELING ACCIDENTS

6.1 *Fuel bundle drop.*

(a) The gap activity (noble gases and halogens) in one row of fuel pins shall be assumed to be released into the water. (Gap activity is 1 percent of total activity in a pin.)

(b) One week decay time before the accident occurs shall be assumed.

(c) Iodine decontamination factor in water shall be 500.

(d) Charcoal filter efficiency for iodines shall be 99 percent.

(e) A realistic fraction of the containment volume shall be assumed to leak to the atmosphere prior to isolating the containment.

(F) Meteorology assumptions — x/Q values shall be 1/10 of those given in AEC Safety Guide No. 3 or 4.

(g) Consequences should be calculated by weighting the effects in different directions by the frequency the wind blows in each direction.

6.2. *Heavy object drop onto fuel in core.*

(a) The gap activity (noble gases and halogens) in one average fuel assembly shall be assumed to be released into the water. (Gap activity shall be 1 percent of total activity in a pin.)

(b) 100 hours of decay time before object is dropped shall be assumed.

(c) Iodine decontamination factor in water shall be 500.

(d) Charcoal filter efficiency for iodines shall be 99 percent.

(e) A realistic fraction of the containment volume shall be assumed to leak to the atmosphere prior to isolating the containment.

(f) Meteorology assumptions — x/Q values shall be 1/10 of those given in AEC Safety Guide No. 3 or 4.

(g) Consequences should be calculated by weighting the effects in different directions by the frequency the wind blows in each direction.

ACCIDENT — 7.0 SPENT FUEL HANDLING ACCIDENT

7.1 *Fuel assembly drop in fuel storage pool.*

(a) The gap activity (noble gases and halogens) in one row of fuel pins shall be assumed to be released into the water. (Gap activity shall be 1 percent of total activity in a pin.)

(b) One week decay time before accident occurs shall be assumed.

(c) Iodine decontamination factor in water shall be 500.

(d) Charcoal filter efficiency for iodines shall be 99 percent.

(e) Meteorology assumptions — x/Q values shall be 1/10 of those given in AEC Safety Guide No. 3 or 4.

(f) Consequences shall be calculated by weighting the effects in different directions by the frequency the wind blows in each direction.

7.2 Heavy object drop onto fuel rack.

(a) The gap activity (noble gases and halogens) in one average fuel assembly shall be assumed to be released into the water. (Gap activity is 1 percent of total activity in a pin).

(b) 30 days decay time before the accident occurs shall be assumed.

(c) Iodine decontamination factor in water shall be 500.

(d) Charcoal filter efficiency for iodines shall be 99 percent.

(e) Meteorology assumptions — x/Q values shall be 1/10 of those given in AEC Safety Guide No. 3 or 4.

(f) Consequences should be calculated by weighting the effects in different directions by the frequency the wind blows in each direction.

7.3 Fuel cask drop.

(a) Noble gas gap activity from one fully loaded fuel cask (120 day cooling) shall be assumed to be released. (Gap activity shall be 1 percent of total activity in the pins).

(b) Meteorology assumptions — x/Q values shall be 1/10 of those given in AEC Safety Guide No. 3 or 4.

(c) Consequences should be calculated by weighting the effects in different directions by the frequency the wind blows in each direction.

ACCIDENT — 8.0 ACCIDENT INITIATION EVENTS CONSIDERED IN DESIGN BASIS EVALUATION IN THE SAFETY ANALYSIS REPORT

8.1 *Loss-of-coolant accidents.*

Small pipe break (6" or less)

(a) Source term — The average radioactivity inventory in the primary coolant shall be assumed (This inventory shall be based on operation with 0.5 percent failed fuel).

(b) Filter efficiencies shall be 95 percent for internal filters and 99 percent for external filters.

(c) 50 percent building mixing for boiling water reactors shall be assumed.

(d) For the effects of Plateout, Sprays, Decontamination Factor in Pool, and Core Sprays the following reduction factors shall be assumed:

For pressurized water reactors — 0.05 with chemical additives in sprays, 0.2 for no chemical additives.
For boiling water reactors — 0.2.

(e) A realistic building leak rate as a function of time shall be assumed.

(f) Meteorology Assumptions — x/Q values shall be 1/10 of those given in AEC Safety Guide No. 3 or 4.

(g) Consequences should be calculated by weighting the effects in different directions by the frequency the wind blows in each direction.

Large pipe break

(a) Source term — The average radioactivity inventory in the primary coolant shall be assumed (This inventory shall be based on operation with 0.5 percent failed fuel), plus release into the coolant of:

For pressurized water reactors — 2 percent of the core inventory of halogens and noble gases.
For boiling water reactors — 0.2 percent of the core inventory of halogens and noble gases.

(b) Filter efficiencies shall be 95 percent for internal filters and 99 percent for external filters.

(c) 50 percent building mixing for boiling water reactors shall be assumed.

(d) For the effects of Plateout, Containment Sprays, Core Sprays (values based on 0.5 percent of halogens in organic form) the following reduction factors shall be assumed:

For pressurized water reactors — 0.05 with chemical additives in sprays, 0.2 for no chemical additives.

For boiling water reactors — 0.2.

(e) A realistic building leak rate as a function of time and including design leakage of steamline valves in BWRs shall be assumed.

(f) Meteorology Assumptions —x/Q values shall be 1/10 of those given in AEC Safety Guide No. 3 or 4.

(g) Consequences should be calculated by weighting the effects in different directions by the frequency the wind blows in each direction.

8.1(a) *Break in instrument line from primary system that penetrates the containment* (lines not provided with isolation capability inside containment).

(a) The primary coolant inventory of noble gases and halogens shall be based on operation with 0.5 percent failed fuel.

(b) Release rate through failed line shall be assumed constant for the four hour duration of the accident.

(c) Charcoal filter efficiency shall be 99 percent.

(d) Reduction factor from combined plateout and building mixing shall be 0.1.

(e) Meteorology assumptions — x/Q values shall be 1/10 of those given in AEC Safety Guide No. 3.

(f) Consequences shall be calculated by weighting the effects in different directions by the frequency the wind blows in each direction.

8.1(a) *Break in instrument line from primary system that penetrates the containment* (lines not provided with isolation capability inside containment).

(a) The primary coolant inventory of noble gases and

halogens shall be based on operation with 0.5 percent failed fuel.

(b) Release rate through failed line shall be assumed constant for the four hour duration of the accident.

(c) Charcoal filter efficiency shall be 99 percent.

(d) Reduction factor from combined plateout and building mixing shall be 0.1.

(e) Meteorology assumptions — x/Q values shall be 1/10 of those given in AEC Safety Guide No. 3.

(f) Consequences shall be calculated by weighting the effects in different directions by the frequency the wind blows in each direction.

8.2(a) *Rod ejection accident (pressurized water reactor).*

(a) 0.2 percent of the core inventory of noble gases and halogens shall be assumed to be released into the primary coolant plus the average inventory in the primary coolant based on operation with 0.5 percent failed fuel.

(b) Loss-of-coolant accident occurs with break size equivalent to diameter of rod housing (see assumptions for Accident 8.1).

8.2(b) *Rod drop accident* (boiling water reactor).

Radioactive material released.

(a) 0.025 percent of the core inventory of noble gases and 0.025 percent of the core inventory of halogens shall be assumed to be released into the coolant.

(b) 1 percent of the halogens in the reactor coolant shall be assumed to be released into the condenser.

(c) The mechanical vacuum pump shall be assumed to be automatically isolated by high radiation signal on the steamline.

(d) Radioactivity shall be assumed to carry over to the condenser where 10 percent of the halogens shall be assumed to be available for leakage from the condenser to the environment at 0.5 percent/day for the course of the accident (24 hours).

(e) Meteorology assumptions — x/Q values shall be 1/10 of those given in AEC Safety Guide No. 3.

(f) Consequences should be calculated by weighting the effects in different directions by the frequency the wind blows in each direction.

8.3(a) *Steamline breaks (pressurized water reactors — outside containment). Break size equal to area of safety valve throat.*

Small break

(a) Primary coolant activity shall be based on operation with 0.5 percent failed fuel. The primary system contribution during the course of the accident shall be based on a 20 gal./day tube leak.
(b) During the course of the accident a halogen reduction factor of 01 shall be applied to the primary coolant source when the steam generator tubes are covered; a factor of 0.5 shall be used when the tubes are uncovered.
(c) Secondary coolant system radioactivity prior to the accident shall be based on:
  (*a*) 20 gallons per day primary-to-secondary leak.
  (*b*) Blowdown of 10 g.p.m.
(d) Volume of one steam generator shall be assumed to be released to the atmosphere with an iodine partition factor of 10.
(c) Meteorology Assumptions — x/Q values shall be 1/10 of those given in AEC Safety Guide No. 4.
(f) Consequences shall be calculated by weighting the effects in different directions by the frequency the wind blows in each direction.

8.3(b) *Steamline breaks (boiling water reactor).*

Small pipe break (of 1/4 ft.²)

(a) Primary coolant activity shall be based on operation with 0.5 percent failed fuel.
(b) The main steamline shall be assumed to fail releasing coolant until 5 seconds after isolation signal is received.
(c) Halogens in the fluid released to the atmosphere shall be at 1/10 the primary system liquid concentration.

(d) Meteorology assumptions — x/Q values shall be 1/10 of those in AEC Safety Guide No. 3.
(e) Consequences shall be calculated by weighting the effects in different directions by the frequency the wind blows in each direction.

Large breaks

(a) Primary coolant activity shall be based on operation with 0.5 percent failed fuel. The primary system contribution during the course of the accident shall be based on a 20 gal./day tube leak.
(b) A halogen reduction factor of 0.5 shall be applied to the primary coolant source during the course of the accident.
(c) Secondary coolant system radioactivity prior to the accident shall be based on:
  (*a*) 20 gallons per day primary-to-secondary leak.
  (*b*) Blowdown of 10 g.p.m.
(d) Volume of one steam generator shall be assumed to be released to the atmosphere with an iodine partition factor of 10.
(e) Meteorology Assumptions — x/Q values shall be 1/10 of those given in AEC Safety Guide No. 4.
(f) Consequences shall be calculated by weighting the effects in different directions by the frequency the wind blows in each direction.

Large break

(a) Primary coolant activity shall be based on operation with 0.5 percent failed fuel.
(b) Main steamline shall be assumed to fail releasing that amount of coolant corresponding to a 5-second isolation time.
(c) 1/2 the halogens in the fluid exiting the break shall be assumed to be released to the atmosphere.
(d) Meteorology assumptions —x/Q values shall be 1/10 of those in AEC Safety Guide No. 3.

(e) Consequences shall be calculated by weighting the effects in different directions by the frequency the wind blows in each direction.

(Sec. 161, 68 Stat. 948; 42 U.S.C. 2201)

For the Atomic Energy Commission.

Dated at Bethesda, Md., this 26th day of November 1971.

W. B. McCool,
Secretary of the Commission.

[FR Doc.71-17564 Filed 11-30-71; 8:55 am]

NATIONAL ENVIRONMENTAL POLICY ACT OF 1969

Public Law 91-190, Approved January 1, 1970

Purpose

Sec. 2. The purposes of this Act are: To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality.

Title 1
Declaration of National Environmental Policy

Sec. 101. (a) The Congress, recognizing the profound impact of man's activity on the interrelations of all components of the natural environment, particularly the profound influences of population growth, high-density urbanization, industrial expansion, resource exploitation, and new and expanding technological advances and recognizing further the critical importance of restoring and maintaining environmental quality to overall welfare and development of man, declares that it is the continuing policy of the Federal Government, in cooperation with State and local governments, and other concerned public and private organizations, to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans.

(b) In order to carry out the policy set forth in this Act, it is the continuing responsibility of the Federal Government to use all practicable means, consistent with other essential considerations of national policy, to improve and coordinate Federal plans, functions, programs, and resources to the end that the Nation may —

(1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

(2) assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings;

(3) attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;

(4) preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity and variety of individual choice;

(5) achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and

(6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

(c) The Congress recognizes that each person should enjoy a healthy environment and that each person has a responsibility to contribute to the preservation and enhancement of the environment.

Sec. 102. The Congress authorizes and directs that to the fullest extent possible: (1) the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with the policies set forth in this Act, and (2) all agencies of the Federal Government shall —

(A) utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts in planning and in decisionmaking which may have an impact on man's environment.

(B) identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by title II of this Act, which will insure that presently unquantified environment amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations;

(C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on —

(i) the environmental impact of the proposed action,

(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,

(iii) alternatives to the proposed action,

(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and

(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

Prior to making any detailed statement, the responsible Federal official shall consult with and obtain the comments of any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved. Copies of such statement and the comments and views of the appropriate Federal, State, and local agencies, which are authorized to develop and enforce environmental standards, shall be made available to the President, the Council on Environmental Quality and to the public as provided by section 552 of title 5, United States Code, and shall accompany the proposal through the existing agency review processes;

(D) study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which

involves unresolved conflicts concerning alternative uses of available resources;

(E) recognize the worldwide and long-range character of environmental problems and, where consistent with the foreign policy of the United States, lend appropriate support to initiatives, resolutions, and programs designed to maximize international cooperation in anticipating and preventing a decline in the quality of mankind's world environment;

(F) make available to States, counties, municipalities, institutions, and individuals, advice and information useful in restoring, maintaining, and enhancing the quality of the environment;

(G) initiate and utilize ecological information in the planning and development of resource-oriented projects; and

(H) assist the Council on Environmental Quality established by title II of this Act.

Sec. 103. All agencies of the Federal Government shall review their present statutory authority, administrative regulations, and current policies and procedures for the purpose of determining whether there are any deficiencies or inconsistencies therein which prohibit full compliance with the purposes and provisions of this Act and shall propose to the President not later than July 1, 1971, such measures as may be necessary to bring their authority and policies into conformity with the intent, purposes, and procedures set forth in this Act.

Sec. 104 Nothing in Section 102 or 103 shall in any way affect the specific statutory obligations of any Federal agency (1) to comply with criteria or standards of environmental quality, (2) to coordinate or consult with any other Federal or State agency, or (3) to act, or refrain from acting contingent upon the recommendations of certification of any other Federal or State agency.

Sec. 105. The policies and goals set forth in this Act are supplementary to those set forth in existing authorizations of Federal agencies.

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